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ANATOMY and ANTHROPOLOGY in MEDICAL EDUCATION

Report of the
Third Teaching Institute
Association of American Medical Colleges
Swampscott, Massachusetts, October 18-22, 1955

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ANDREAE VESALII
BRVXELLENSIS, SCHOLAE
medicorum Patauinæ professoris, de
Humani corporis fabrica
Libri septem.

Report of the Third Teaching Institute
Association of American Medical Colleges
Swampscott, Massachusetts, October 18-22, 1955

The Teaching of Anatomy and Anthropology in Medical Education

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Preface

THE ROOTS OF anatomy run deep—to Galen, to Aristotle, to their origins in the valleys of the Euphrates and the Nile. Long before medieval scholasticism had yielded to Renaissance thinking, anatomists were emerging as the dominant teachers in the faculties of medicine. There is no older faculty in the university than that of medicine, its beginning dating back 900 years to the first, the School of Salerno. Montpellier, Paris, Bologna, Padua followed. Thus medicine—the mother faculty of all scientific faculties—with the anatomist as its central figure, is the nurturer of science.

With the publication in 1543 of the *Fabrica*, Vesalius became "the first man of modern science." By his monumental work he "established with startling suddenness the beginning of modern observational science and research"—to use the words of Saunders and O'Malley. With Vesalius, anatomy became the first discipline to be pursued by modern scientific methods.

Since Vesalius, but beginning in the earlier university setting—indeed long before—anatomists have striven with deeper understanding and intensity to guide students to accurate observation and precise description, to orderly thinking, to experimentation and logical conclusion. They have understood the boundless worth of knowledge. Along with the astronomer, the alchemist, the doctor of physic, the anatomist led in the eager exploration of nature, paving the way for Francis Bacon. *The Advancement of Learning*, published by Bacon in 1605, was the first great prose work in English on a secular subject. Its impact was immense. Bacon's object was to justify learning by setting forth its dignity and true value. In arguing for the necessity of advancing knowledge, he unified the thinking of his day and showed that natural phenomena are to be studied for their own sakes.

It is in this long and great tradition, then, that anatomy has been the wellspring of medicine. I use the term "anatomy" as I understand it in its modern sense: the dynamic relationships among structures and systems, the architecture of physiological function as Barcroft has called it. Obviously I do not restrict anatomy to its descriptive aspects, although these are necessarily part of anatomy. Medicine has owed the most to the anatomist, deriving depth and breadth from his age-old role in the university. And his university orientation becomes increasingly important as scientific disciplines multiply and increase in complexity. Today, the anatomist probes ever more deeply into cellular structure. The electron microscope is but his newest tool. As a cytologist, he is approaching common objectives at the molecular level with physicists, chemists and biologists, with physiologists, biochemists and bacteriologists. The anatomist, whose great privilege it usually is to start the student on his professional career, is therefore uniquely equipped to introduce human biology in its broadest university aspects to the future physician. More than any other, he can bridge for the student the all too often wide crevasse between the undergraduate college and medical school.

As stressed by Dr. William U. Gardner in his excellent Introduction

which follows, these points were emphasized at Swampscott during the Teaching Institute on "Anatomy and Anthropology." This title might possibly suggest to some a new and strange alliance in the academic world. Quite the contrary. Anthropology, although expanding rapidly in its own right, is a natural extension of anatomy. The Institute, accordingly, recognized the continuing growth of the anatomist's domain, a growth that started long before the Renaissance and has ever since been restless and unceasing.

In anatomy, as in other major areas of medical education—indeed in all professional education—the success of the enterprise resides in the maintenance of a skillful balance between *education* and *training*. By *training*, I refer to the process whereby the student is required to assimilate masses of facts, not necessarily related or explored on the basis of evidence as to their validity. In sharp contrast, *education* is a process of growth. It demands of the student that he work and think for himself. The teacher's function is to encourage and criticize. Training does not necessarily improve the mind; it may even dampen curiosity and impede initiative. Education, on the other hand, fosters the development of the finest minds. No one has put this more succinctly than Whitehead, who asserted in 1929 in *The Aims of Education* that "education is the acquisition of the art of utilization of knowledge."

In my presidential talk on "Medical Education in Transition" at Colorado Springs in 1952, when I proposed the present series of Teaching Institutes, I endeavored in the same way to focus on this central problem. Medical education is *good*, and good only when it is good *education*.

Dr. G. W. Pickering, whose incisive observations on medical education were presented in his convocation address to the American College of Physicians meeting in Philadelphia in April of 1955 (published in the *Annals of Internal Medicine* for November and abstracted in *The Lancet* for December 3), is persuaded that it would be preferable to send medical students into the professional world knowing less, but understanding better how to learn. Their stock of facts will become a steadily diminishing asset. If they have not learned how to learn, they never will.

To the viewpoint that Pickering has so effectively expressed in his convocation address, I subscribe completely. I subscribe also to his wise comments on the unfortunate consequences of unending addition to the curriculum, without appropriate subtraction. The crippling result for the future doctor is this: more and more teaching and learning time is devoted to training, as I have designated it—Pickering calls it "instruction"—less and less time to education.

The maintenance of the optimal balance between education and training in the medical sciences—no less or no more in anatomy than in other fields—was perhaps the most perplexing of the issues scrutinized at Swampscott. Its magnitude was well illustrated by the adroit observation of one participant, namely that gross anatomy floors the medical student when he is asked to use "a 1200-hour textbook for a 300-hour course." Much of the discussion presented in our Report, *The Teaching of Anatomy and An-*

thropology in Medical Education, deals with suggested attacks on this and other seemingly paradoxical situations.

At Swampscott from October 18 to 22, 1955, at the third Teaching Institute, 127 participants, invited from each of the medical schools of the United States and Canada and from several more distant schools as well, proceeded under the imaginative leadership of Dr. Gardner to re-examine vigorously and thoroughly all aspects of the teaching of anatomy and anthropology. A year before at French Lick, under the chairmanship of Dr. Douglas H. Sprunt and the co-chairmanship of Dr. Robert A. Moore, the second Teaching Institute dealt with "Pathology, Microbiology, Immunology and Genetics." The door was flung wide open at that time for the potentially greater contributions of geneticists to medical education. Similarly, at Swampscott, the anatomists drew on the wide spectrum of talents of their university colleagues, the anthropologists, in their joint scrutiny of teaching and learning problems of vital significance to medical education and biological science.

The first of the present series of three Teaching Institutes concerned with the medical sciences was held under the auspices of the Association of American Medical Colleges at Atlantic City in October of 1953 under the chairmanship of Dr. Julius H. Comroe, Jr. I served as co-chairman. Its subject was "Physiology, Biochemistry and Pharmacology." Dr. Comroe's zeal and the unremitting efforts of the participants set at this Institute the high level of excellence that has been a continuing inspiration ever since.

The Teaching Institute on "Anatomy and Anthropolgy," which immediately preceded the Association's 66th Annual Meeting, is the sixth activity of this type since 1951 with which I have been concerned. In June of that year, and again the following June, the Association joined forces with the American Psychiatric Association to conduct a "Conference on Psychiatric Education." In November of 1952, under Dr. Lloyd Florio and Dr. Ward Darley acting as co-chairmen, the Association sponsored a conference at Colorado Springs on "Preventive Medicine in Medical Schools."

Each of these six efforts to dissect key problems in medical education has been a milestone of progress in the Association's postwar program to help teachers create better educational opportunities for the doctors-of-tomorrow. These "national faculty meetings" have been in the finest university tradition.

Having explored since 1951 such extensive areas as psychiatry and preventive medicine, and having then put under the microscope each of the medical sciences, the Teaching Institutes will focus for the next two years on "The Evaluation of the Student." It is proposed to review critically all our procedures to appraise him as an applicant for entrance to medical study, to measure his intellectual and other characteristics, indeed to examine minutely all the known ecological factors that contribute to his learning opportunities and professional development. Thereafter, it is the plan of the Committee on Educational Research and Services to move on to the orderly examination of all phases of clinical teaching and postgraduate education in medicine.

As many of us have come to realize, the Institutes have been exciting and rewarding adventures for the participants. This was certainly the case at Swampscott. Early in the discussions last fall, there was some expression of the widespread misconception that anatomy has fallen into disrepute because it is static. As rapidly became clear in the light of today's interpretation of human anatomy as the study of all aspects of man from the egg to senescence, no field of human endeavor could more properly be characterized as dynamic. One participant struck the keynote, whimsically yet profoundly, with his remark that "in anatomy no policies of teaching and only certain specimens should be cut and dried."

GEORGE PACKER BERRY, M.D.
Dean, Harvard Medical School
Chairman, Committee on Educational Research and Services
Association of American Medical Colleges

Boston, Massachusetts
August 1, 1956

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Introduction

William U. Gardner

EDUCATION IN ALL morphological aspects of human biology had already begun to supplant didactic training in anatomy when the anatomists first met in 1888 to form their present professional society. An era of emphasis on descriptive detail was yielding to an era more concerned with the *how* and *why*. From the beginning the members of the American Association of Anatomists were confronted with their responsibility as teachers and the development of the role of anatomy in medical education. The "one-year anatomical course" was discussed at length as early as 1902. The early anatomists sought to devise a teaching program based on inquiry into frontier areas and on application of scientific methodology. Their efforts were even then directed not toward making anatomy an applied aspect of the art of medicine but toward emphasizing the contribution that additional comprehension of human morphology can make to the understanding of human biology and to the basic medical sciences.

Several early presidents of the Association expressed a real concern with the basic objectives of anatomists in medical education. James Playfair McMurrich stated in 1909: "If we devote our energies to the graduation of adepts in the art of Medicine, ignorant of the sciences upon which the art must rest, we are failing in our duty; and similarly, if we overload our students with the facts of anatomy, without giving them the scientific bases which make the facts intelligible, we are placing their feet upon the high road to empiricism."[1]

Ross G. Harrison in 1913 pointed out: "The greatest danger to anatomy, strange to say, lies in the very fact of its practical importance. It is this circumstance that, in England and America, has threatened, and even now threatens, to make the science subservient to practice. This is felt both in teaching and research. Teaching has been mainly a drill and an exercise in details of dissection and the manner in which even embryology and histology are usually presented does not altogether alleviate the situation. Admitting that some of the drill is necessary, and that it has at least the merit of inculcating a certain spirit of thoroughness and mastery of detail, it cannot be gainsaid that it is but to dull the intellect of the student if the power of reasoning is subordinated to the memory drill and the broad general bearings of the subject are allowed to be overshadowed by the purely practical ones."[2] In 1917 "The teaching of anatomy and the inculcation of scientific methods" was the subject of a symposium sponsored by the Association.

The early struggles against overemphasis on the applied aspects of

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[1] MCMURRICH, JAMES PLAYFAIR: "Conservatism in Anatomy," *Anat. Rec.* 3:23, 1909.
[2] *Anat. Rec.* 7:403, 1913.

anatomy were reasonably effective. Men trained in medicine qualified for professorships in basic sciences and more frequently men trained in biological sciences became professors of human anatomy. The number of teachers with full-time activities in anatomy increased. Considerably more time was spent on research. Today more than half of the teachers of anatomy have, instead of a medical degree, graduate degrees for studies in many different subjects, sometimes quite removed from anatomy.

It seems, then, particularly appropriate at this time to re-examine the situation in which the teaching of anatomy finds itself, to reflect upon the past and to anticipate if not plan for the future.

Anatomists are still concerned with their role in medical education. They are still raising questions and listening to those posed by others. The experimental rather than the descriptive approach has become basic to much anatomical teaching. Interest has turned toward methods of integrating anatomical subjects with one another and with other aspects of human biology. Exemplifying this, a symposium on "the closely correlated or integrated course in anatomy" was presented in 1953, in which anatomists discussed four different proposals for unification of subject matter in human morphology.

The introduction and assimilation of the principles of the experimental method into anatomy at the end of the last century and the first 20 years of this century have inevitably brought about major changes in educational policies and techniques in anatomical instruction. "Human institutions like human beings necessarily adjust themselves to the changing tides of life."[3] To the basic biological sciences and to human biology the anatomists have made vital contributions. Their struggle has made an impact on the development of the medical curriculum, to the extent that much of the classical in anatomy has been de-emphasized.

Almost half of the time of anatomists today is spent in research, slightly less in teaching. But because the anatomists have not been accustomed, in recent years, to assemble to discuss much besides the reports of their research (and this has been exciting and diverse), the other important aspect of their activities has been to some extent neglected. Their teaching enthusiasms have been disproportionately submerged. Their responsibilities in medical education have been limited to local situations, or have been the focus of attention of relatively unorganized small group discussions, frequently given over to voicing complaints. "The emphasis on research, resulting in brilliant successes, and concurrently the relegation of teaching to a more prosaic, secondary place, have altered in a corresponding degree the goals of individuals who enter the field of anatomy."[4]

This is not meant to suggest that each in his own environment does not spend considerable time contemplating problems relevant to education. But it is undeniable that the impression too often given is that educational functions are incidental to research. Frequently by action and word we

[3]ANGELL, JAMES ROWLAND: a quotation from *A History of Yale College* by G. W. Pierson, Yale University Press, 1935.

[4]CONDON, E. D.: *Anat. Rec.* 117:806, 1953.

imply a dichotomy of interest because one aspect of that interest has received such predominant consideration. This cleavage is of course neither so clear nor so precise as might appear to be indicated by usage of words. There is difficulty always in distinguishing between the hours spent in the laboratory and those spent in teaching. Often they overlap. Unjustly or not, however, research has predominated in consideration. "When we consider the impressive amount of anatomical research, it seems not too much to expect that a small fraction of the energy and skill should be deflected to experimentation in teaching for the benefit of the thousands of students who pass through the anatomical departments of this country."[5]

What, then, could we hope to accomplish at a conference of teachers addressed to the problems of education—both teaching and learning? The challenge was exciting, although hedged, for some, with reservations. The evangelistic reformer, or the system-deviser; the perennial changer, or his counterpart, the advocate of "what was good enough for me is good enough today"— to all of these we have built up resistance and suspicion. Could an effective educational conference take place, without suffering exploitation from these familiar extremists?

The conference of the Teaching Institute was devised, not to bring the stereotyped thinking of pedants to apply to the very real problems faced by anatomists, but to encourage us to probe into our own problems and come up with our own answers. What is the value of the ideas on teaching held by those of us who practice it? How may they be tested and evaluated objectively? Or do we in fact have valid educational theories on which to structure the complex mass of details and concepts that comprise a course in anatomy?

The Committee for the Third Teaching Institute undertook the planning of the conference with a certain amount of trepidation not unlike that of some of the participants who attended the Teaching Institute for the first time. What would be the value of inter-school exchange of ideas on the teaching of anatomy and anthropology? Could objective and enthusiastic participation be assured? How could such a meeting be most effectively conducted?

Several members of the Planning Committee had fortunately been present at the earlier Teaching Institute on Pathology, Microbiology, Immunology and Genetics, where they had had opportunity to observe 120 faculty members from medical schools discuss, provocatively and constructively, the problems of teacher and student and the objectives and interrelationships of teaching. The two earlier institutes had devised effective mechanisms for such a meeting—as George Packer Berry described it, "The best type of faculty meeting on a national scale," actually almost on a continental scale. The Planning Committee was therefore able to avail itself of mechanisms that had already proven effective in practice, and was able to devote itself primarily to the subject-matter of the forthcoming Institute.

Originally this had been announced as the Teaching Institute on Anatomy, Histology, Embryology and Anthropology. These subjects in medical schools are most frequently grouped in one department, including also

[5]Condon, E. D.: *Anat. Rec.* 117:817, 1953.

neuroanatomy. The Institute was presumably to encompass education in all aspects of human morphology and medical anthropology—two different conceptual approaches to human biology, each employing a variety of techniques for elaboration. The title of the Institute eventually became the Teaching Institute on Anatomy and Anthropology.

The committee was well aware that the disciplines on which the Institute converged were less diverse than those grouped together at the earlier institues. This might result in the conference being more inbred, lacking the hybrid vigor that had contributed much to the stimulating sessions that had preceded it. On the other hand, it afforded a unique opportunity to bring together colleagues who, concerned with one broad spectrum of the medical sciences, might therefore address themselves to their mutual problems with undivided concentration.

The committee was also aware of the invitation to experimentation and unorthodoxy implict in the fact that this teaching institute had been placed third in sequence because of a desire "to help us escape from our habitual thinking that the study of medicine should necessarily begin with anatomy," in spite of its usual temporal position in existing curricula of medical schools.

Inevitably the entire series of Teaching Institutes must share some common content. There are many problems of education pertinent to all disciplines involved. The problems of the student in pathology and biochemistry differ little from those of the student of anatomy. Attempts have been made to reduce repetition to a minimum; reference therefore to the reports of the preceding institutes is recommended.

Seven relatively definable topics took shape in the early planning sessions about which discussion might be focused. *The role of the anatomical disciplines in medical education* was designated as the first topic because of the desire to discuss the broad role of morphological concepts in medical sciences and their application for the future. Are they as significant today as they were earlier? How are they related to other basic concepts? Have they unique qualities that modify ways of teaching them? These would be the general topics discussed. The term "anatomical disciplines" was selected advisedly. Instruction and research in human morphology are not limited to those who are designated as anatomists; many concepts of anatomy are acquired from contacts with those who are not anatomists.

Anthropology in medical education should constitute a separate topic. Physical anthropology, including genetics, growth and development, variation, comparative and cultural anthropology and evolution should be discussed. The aspects of human biology encompassed by anthropology merit consideration as medicine increasingly becomes concerned with health and ways of assessing well-being, as the problems of control of disease decline. Because the concepts of anthropology are not represented on many faculties of our medical schools, or if represented are not designated as such, it was thought that a more formalized presentation of the subject would be most profitable. Informal discussion might suffer from the limited experiences of a majority of participants. A presentation by those with more

sustained interest and experience in the field could be more prophetic and challenging. Therefore a panel was arranged to discuss four aspects of this topic.

Because anatomy is the first major experience of young men and women in their professional education, the *preprofessional preparation for anatomy* was established as a third topic for discussion. More than any other single course, instruction in anatomy has hinged upon the groundwork given during undergraduate years. When the basic premedical preparation of students in the biological subjects is changed, the problems of anatomists also change.

Instruction and learning in anatomy constituted a fourth discussion topic. Here the methods used in teaching, techniques of presentation, the arrangement and sequence of courses, and the teaching aids used would be explored. Special aspects of the problems of teachers and students might be given consideration.

Historically, anatomy was the first aspect of human biology to contribute extensively to medical science. Morphology at one time provided the major observational experience of those who were acquiring a knowledge of human biology and medicine. As new disciplines developed, they became part of medical educational requirements. The new comprehensions were won by the application of the experimental method and inquiry into the unknown. Morphological concepts and details increased apace. *The stimulus of research on teaching in anatomy* thus included the impact of new techniques not only on human morphology but on the relation of anatomy to the augmented biochemical and physiological knowledge. This became another essential topic on the program.

The recruitment and training of teachers of anatomy was another issue meriting consideration. The enlarged enrollment in medical schools, the increased number of schools and specialized research institutes and laboratories, and the great demand for the limited commodity, able young manpower with experience in experimental and descriptive morphology, emphasize the urgency of attention to this issue.

To many, *the teaching opportunities and responsibilities in clinical and postdoctoral years* seemed a logical theme on which to center final discussion. For a large number of anatomists, however, teaching is confined to the first or second years in medical school. The reduction of time available for basic courses in anatomy, as other disciplines began to contribute significantly to medical education, has made it inevitable that anatomists assist in the education of those in need of special knowledge of parts of anatomy. Clinicians, too, are becoming more and more interested in basic medical science, and may even be defined as "basic medical scientists with clinical responsibilities." Although the major concern of anatomists continues to be undergraduate medical education "to provide a solid foundation for the future physician's development," the foundation obviously must be broadened and deepened at the graduate level.

Inevitably the seven topics listed above overlap. Whether anatomy is to be taught because it is necessary to understand human morphology in order to

appreciate human biology, or whether it is taught for its relevance in resetting a dislocated shoulder might be considered under the first, fourth or seventh topic. Innumerable similar examples might be cited. It was thought, however, that such overlapping would be inconsequential in comparison to the hazard of overlooking a significant aspect of these subjects.

The Teaching Institute was not planned to sketch blueprints for an ideal future. It was not an attempt to solve all of the knotty and realistic problems inescapably faced by those who are actively involved in day-to-day interpretation of this basic medical science. By affording the participants opportunity for discussion of the objectives and pertinence of their discipline, and creating the environment for a reappraisal of the role of anatomy in medical teaching, it contributed to constructive exploration of this crucial area of medical education. The impact it may have on those who participated should be felt increasingly in the days to come.

This report often reflects the contradictory opinions of teachers of anatomy and of the participants at the Institute. It presents data and discussion of some problems of teaching anatomy and anthropology that may be useful in designing our own teaching programs and policies. The reports may reflect some of the personal prejudices of the Editorial Committee but attempts have been made to present divergent opinions or viewpoints rather than to emphasize any one conviction, unless of course this conviction seemed relatively unanimous. Unanimity of opinion, other than in relation to certain generalizations, was not a unique characteristic of the Institute. This report may therefore seem indecisive; attempts have not been made to make it otherwise.

I

The Role of the Anatomical Disciplines in Medical Education

Undergraduate medical education must provide a solid foundation for the future physician's development.—G. P. BERRY, 1953.

THE BASIC MEDICAL sciences have much in common in their roles in medical education: they all contribute to a basic comprehension of human biology. The role of the anatomical disciplines in this multipartite responsibility is to contribute broadly to the students' comprehension of human morphology—its developmental, microscopic, gross and functional aspects. The boundaries of subject matter between the different basic medical sciences are not sharply defined. The classical techniques used in teaching the different basic sciences may contrast sharply but none of the subjects is limited to classical approaches. The techniques used currently in the elaboration of and instruction in the different basic sciences have broad areas of overlap.

At each of the preceding Teaching Institutes, the roles of the specific disciplines in medical education were discussed. The different disciplines share common responsibilities and these have been presented admirably in the reports of the earlier institutes.

The morphological disciplines are unique (a) in that they usually constitute the first major professional educational experiences of medical students, and (b) in that they are so largely concerned restrictively with man that medical students are taught human anatomy almost exclusively. Another characteristic is the massiveness of the subject matter which an abundant heritage and long tradition have provided.

The anatomists are usually the first to contact the freshman students of medicine. They assume the responsibility of helping the student acquire an understanding of how man develops, of his definitive structure, and something of the many structural and functional interrelations and structural variation and individuality. For much of their basic teaching the anatomists find less opportunity to delve into comparative biology than do teachers of some other basic disciplines.

Anatomists, because of their early and extensive contacts with students in their new environment, have unusual educational responsibilities in addition to those directly related to the subject matter of the courses. Much of the anatomist's time is taken up by the problems of students when they find it necessary to observe and integrate the massive subject matter of human

biology, and when they find it necessary to discipline themselves to the rigorous schedules and the self-evaluation required.

Position in the curriculum

Participants at the Institute were reminded that anatomy was not originally the subject by which the future physician was introduced to medicine. Only within the past century has it come to occupy its present position. Is the tradition sound which places it here? Questioning such an established procedure led to fruitful examination of its validity. Because a discussion of function becomes easier if the structures are known first, anatomy is appropriately scheduled early in the curriculum; but it does not necessarily follow that all of it should be taught or learned within the first two years, as is frequent in current practice (see also Chapter VII).

Among the 90 departments of anatomy responding to one of a series of questionnaires that were distributed and analyzed prior to the Institute (See Appendix B), six offered a required course in applied anatomy averaging 37 hours in length for second-year students. Eight had courses in neuroanatomy averaging 76 hours in length in the second year (see Table A.1[1]). Only 18 per cent of the anatomy departments reporting scheduled required courses after the second year.

Obviously a first course must bridge the gap between undergraduate subject matter and study methods, and the more exacting demands of the medical curriculum. Anatomy was thought aptly suited to this role, both because of content and teaching techniques.

Subject matter. Anatomy is the basic medical science most closely allied with the biological sciences to which, in the past at least, the student has presumably been introduced in college. Even more than biochemistry and physiology, it has provided a link with premedical education. A questionnaire distributed to samples of freshman and senior medical students disclosed, however, that only 50 per cent of the medical students queried had majored in biological subjects during college, and 10 per cent fewer actually expressed preference for such a major (see Table 3.5). Perhaps anatomy is less closely tied in with premedical training than many have generally assumed, and in the future it may be even less closely related to premedical experiences (See Chapter III for further discussion). Nevertheless, instruction in anatomy will probably still provide basic biological concepts that the student will need throughout his subsequent medical career.

Moreover, the study of structure is basic to all biological and medical education. The student must have some idea of the body, its cells, tissues and organ systems before he can study its functions and disorders and be effective in physiology or pathology. A large part of the scientific vocabulary he will use throughout his carer will be first learned from his studies in human morphology. As one participant expressed it: "It is necessary to provide the student with a 'body image' of the development and structure

[1]Tables that appear in Appendix C are designated "A;" other tables are designated by the number of the chapter in which they occur and are numbered sequentially within chapters.

of the human body, since the latter will be his *piece de milieu* throughout his career."

Techniques. The educational techniques afforded by anatomy also justify its position early in the curriculum. Gross anatomy emphasizes precise and direct observational methods, though it is not divorced from the complexities of deduction. Its tremendous scope and emphasis on details challenge the student to organize his time efficiently and his information intelligently. It puts a premium on careful workmanship and effective study habits. Microscopic and neuroanatomy exploit techniques used as well by biochemists, biophysicists and physiologists in addition to those that are more classical.

Function of anatomists

The primary function of anatomists is the creation of an environment in which students may acquire a basic comprehension of human morphology and an appreciation of the developing and ultimate individuality of man, predominately the physical man. In addition it provides a groundwork, both in subject matter and experience, for further studies. The techniques employed make it necessary for students to acquire a capacity for accurate observation. Probably the greatest concern of the anatomist is not with the instruction in morphological detail, much of which is presented in books; rather it is with the problem of getting students to see themselves and their fellowmen from the point of view of their finer and more gross structural units, to observe accurately and to appreciate biological variability.

The contacts of a doctor with a patient or of a scientist with an idea are very personal. The responsibility for the observation, the analysis, and the subsequent procedures are individual and at the moment decisive. Knowledge of the experiences of others augments the probabilities of a wise decision, but basic to this is accurate original observation. The subject matter of anatomy, in all of its aspects, lends itself admirably to training in accurate and precise observation.

Some participants emphasized that instruction in anatomical disciplines extends much farther, that implicit in the teaching of observation and study was the next step—gathering evidence and arriving at logical conclusions; in short, developing an experimental approach. This is true, undoubtedly, of anatomy as with other basic sciences; it is not a unique feature of the morphological sciences. In addition the cultivation of a student's ability to present his observations to others was considered an important function frequently assumed by anatomists.

In the words of one participant: "Anatomy has a real opportunity to train the student in basic principles of observation, deduction and interpretation. The role of the anatomist is more significant in this area than in the area of factual learning." Anatomy is a subject that can be considered not only in three but in four dimensions. The dimension of time implies morphology from the fertilized egg to the aged individual and emphasizes the dynamic changes in morphology. The transmission of this multidimensional concept to students who have been exposed to merely one or two dimensions in previous subject matter is important.

On the other hand a reasonable amount of detailed knowledge of anatomy is required before intelligent interpretation can be expected and must accompany observation. One participant pointed out that this aspect of anatomical education was not sufficiently recognized by medical educators: "Few specialists in other fields recognize how much time present-day anatomists devote to introducing students to concepts of the correlation between structure and function and the integrated functioning of the human body. Jacques Loeb said almost 50 years ago that much of what is considered mammalian or human physiology is in reality functional anatomy, and should be taught by specially trained anatomists. Loeb's prophecy has come to pass in most anatomy departments of the present day."

Application to clinical problems

Not only does anatomy provide the basis upon which other basic medical disciplines build, but it also has innumerable direct applications to clinical problems, as has been attested by surgeons and physicians interested in physical diagnosis. Practical application used to account for a large part of anatomy teaching. When inroads on anatomy time began around 1910, emphasis on applied and topographical anatomy decreased in the first-year courses. Increasing desire is evident on the part of clinicians to have students introduced to the embryological basis of clinical problems and to understand the application of anatomy to the study of disordered structure and function. The growing fields of gerontology, preventive medicine and psychosomatic medicine, to mention only a few examples, have increased the need for students to learn more about the changes in structure during the life cycle and the influence of the nervous system upon other organs of the body.

A science in its own right

No matter what its clinical applications might be, there was universal agreement that basic courses in anatomy should be taught for their own sake and should not be evaluated on the basis of their importance to other disciplines. Anatomy should be presented as a branch of biology and as a growing science. It is a handmaiden to no other discipline. The point of view that it should be taught for its own sake as a pure science, and on the other hand that it should be taught as a practical subject for application to clinical medicine, were thought not to be mutually exclusive; practical applications often afford admirable examples for illustrating basic anatomy. Many basic advances stem directly from the requirements of application.

Points of definition of what is basic and what is applied often arose. Recent trends for a better correlation between the study of anatomy and the other subjects of the medical curriculum are quite general. Integrations with other subjects tend to evolve when the techniques and concepts of the different disciplines merge. Neuroanatomy and neurophysiology may be increasingly amalgamated as basic neurology.

Anatomists today, however, are willing to provide courses for upper-class students that relate specifically to application (See Chapter VII and the section "Advanced Education in Anatomy" in this chapter.) They realize

that the anatomy is the same but the point of view of the teachers and context are the variables.

In discussing whether priority of emphasis should be placed on facts or principles, the opinion was frequently reiterated that the teaching of anatomy is to lead the student to the comprehension of principles. This is more important than the assimilation of detail which in the eyes of many is the hallmark of anatomy. One participant expressed the viewpoint of many in pointing out that the study of anatomy should not be confined to the body in a static state but should lead the student to appreciate the body in its changes from day to day. It was agreed that the ability to recite out of a book can be meaningless; the student must be able to formulate his own mental picture and be able to transmit this picture in his own words. To accomplish this end, anatomical staffs might be expanded and encouraged to develop new and broader outlooks. (For more on this see Chapter IV).

One discussant cogently presented this point of view in reference to histology: "The old concept of histology is one of simple fixed morphology. The new concepts adapt this morphology to histochemistry, electron-microscopy and others. The field is too large to expect memorization of all facets. The basic course should therefore be a mere introduction. This approach is desirable in order to stimulate attitudes and aptitudes for research, all of which are practicable under present time allotments. The subject of histology has no dimensions; therefore the aim should be to provide the student simply with perspective."

Questionnaire disclosures

Responses of fourth-year students to their questionnaire indicated only moderate success in achieving the goals described, in developing learning techniques and influencing attitudes toward subsequent medical courses. Only 58 per cent of 560 students queried answered "yes" to the question, "Did your anatomy course contribute significantly to your basic attitudes toward later courses?" Only 7 per cent answered "no" however; 37 per cent answered "not particularly." To another (multiple response) question, of 355 students responding, 146 thought that anatomy "aided in clinical understanding, and was helpful in diagnosis." Such training had helped 69 to "organize material and develop good study techniques." Only 12 stated that anatomy had "developed insight and stimulated interest."

Critical comments were made by 33 students who deplored the inadequacy of correlation between anatomy and clinical courses; 25 who stated there was too much emphasis on memory, that the courses were too factual and didactic: 11 who thought there was not enough factual material presented; and 14 who, because of the difficulties of recall, thought anatomy should be given in later years.

Other responsibilities of anatomists

The question was asked whether anatomists have any particular responsibility for the general education of the medical student, aside from teaching him how to learn, and instilling in him adequate comprehension of some

biological principles. There was, it was thought by many, an additional area in their domain: instilling an adequate comprehension of general questions of biological principles and of social relationships. In many schools the psychiatrists have a small part in the first year curriculum in providing opportunities for students to discuss social relations, but as a rule it falls to the anatomists to offer the means whereby the students may discuss, or learn in some other way, the broad problems of human biology which come under such special headings as genetics, heredity, constitution, anthropology, congenital malformations, variation, growth and development, and range of normality.

Anatomists must frequently deal with personal problems that stem from what one participant described as "the disorientation, maladjustment and ignorance in the minds of medical students concerning the realities of life and their relation to medicine." Traditionally, anatomists have served as father confessors to many students with special problems. "In every school the anatomists bear a large share of the burden in making medical men out of college boys." The close student-teacher contact afforded by the informal atmosphere of the laboratory where most anatomy is learned (see Table A.1) makes it possible for anatomists to acquaint themselves with the special needs and capacities of individual students and to know where they can be of help. Instruction in anatomy has always afforded an unusual amount of contact between student and teacher; the problems of conference or personalized instruction are not as great therefore as with some other medical disciplines.

Some participants thought that, since members of anatomy departments meet the students first, and necessarily deal with such personal problems as anxiety and stress, the faculty-student ratio should be high. The median ratio between students and full-time teachers of anatomy in basic courses given today in medical schools is 30 to 1 (see Table 4.15 in Chapter IV). A proportion of 20 to 1 was preferred by a majority of those who answered the questionnaire. This was substantiated in the discussion at the Institute.

The unusual anxiety evident among freshmen is frequently attributed to the subject matter of anatomy. The point was made that any department initiating the study of medicine would find itself confronted with a similar situation because of the present-day demands of medical education. It was not necessarily the fault of course content.

Anatomists bear their share of responsibility not only in alleviating anxieties but in preserving the high enthusiasms with which students arrive at medical school and in fostering the curiosity of the inquiring student; in short, maintaining or increasing motivation.

Anatomy teachers must help remedy deficiencies common among first-year students: teach them how to study, prepare for and take examinations, and use the library intelligently. In all of this the teacher must encourage self-reliance and sound attitudes for self-education. He should encourage a student to have broad interests. That some anatomy departments failed in sufficiently engendering this latter quality was conceded. Greater emphasis should be placed upon broadening comprehension and augmenting independence.

Teaching attributes

To acquire and develop sound habits and attitudes of self-education, the student must have the guidance of individuals who are interested in teaching, will take the time to teach, and are interested in increasing their own knowledge. The impact of a teacher's personality is infinitely more important than any teaching technique or system, and his judgment must, in the final analysis, determine the character and aims of the course. Flexibility rather than rigidity of pattern is preferable, leaving to the teacher the choice of such techniques as are adaptable to the local situation. One of the members of the Institute expressed his point of view as follows: "Teachers will always be individuals. One teaches a great mass of material; another portrays the beauty of the field. The one may drown the student in detail, the other endeavors to teach him how to swim. The time and method allotted to any one approach of anatomy are not the important factors determining teaching efficiency. The crucial features are the breadth of wisdom imparted and the degree of imagination stimulated."

It was urged that funds available for research in the medical sciences, wherever possible, be used not only to further research but to increase the number of available teachers. Although research and teaching go hand in hand and belong together, excessive research responsibilities frequently may detract from teaching. The danger was thought to be a very real one. Grants and gifts, which have a stimulating and broadening influence in departments of anatomy, have to some extent diminished emphasis on the art of teaching.

Learning by doing

An important part of the learning process includes scanning the scientific frontiers along which advances of knowledge are being made. An understanding of how the body of knowledge in any science is gradually pushed forward is fundamental to the maturation of the scientific mind. Teachers concerned with increasing a student's capacity for self-education encourage him to learn by doing. A questionnaire disclosed that many schools were attempting to give students opportunities for more correlation of material during the first year, with emphasis on learning to synthesize material for themselves. It was disheartening to many of the anatomists present at the Institute to learn that many experimental teaching projects involving research and informal seminars had been discontinued. On the other hand, an equal number of such projects appeared to have flourished. (Table 1.1; see also Table A.2).

Correlated teaching

While correlated teaching did not come in for extensive evaluation, comment was to the effect that, for efficiency in this type of teaching, staffs would have to be developed appropriately and this could be done only gradually. Many agreed that it accentuated motivation but thought that evaluation of present experiments is still awaited and judgment should be reserved (see Chapter IV for elaboration). The possibility that vertical scheduling of subjects might lead to teaching viscerology, neuroanatomy,

TABLE 1.1

THE SUCCESS OF EXPERIMENTAL EDUCATION PROGRAMS IN ANATOMY
(Participants group; Multiple response)

Item cited in regard to experimental education programs*	No. of respondents citing item (total N = 87)†	
	Schools trying experiments	Schools abandoning experiments
Number of experiments tried or abandoned		
None	23	37
One experiment	30	25
Two experiments	10	2
Three experiments	1	2
Four experiments	3	0
Five experiments	2	0
No response	18	21
Methods of evaluating success (cited by 31 respondents)		
Student comments and report	12	
Examinations	9	
Faculty opinion	5	
Period of experimentation was too short to permit evaluation	3	
Common sense	2	
No attempt to evaluate	2	
Student performance, board and professional examinations	2	
Student-faculty conferences	1	
Upper-class faculty	1	
Reasons for discontinuing experiments (cited by 80 respondents)		
Experimental procedure is time consuming and ineffectual		11
Lack of faculty cooperation and interest or support		4
Lack of student interest		4
Shortage of teachers or teaching time		4
Unsatisfactory results		4
Change in administration		3
Difficulty in obtaining real integration		3
Change in National Board Exams		1
Poor organization of course		1
Preferential treatment of some students		1
Unfavorable comment by clinical faculty		1

*Includes experimental teaching practices which are not part of a formal experimental program.

†When questioned about willingness to consider planned experimentation with teaching methods, the response of this total group was as follows: willing, 57 per cent; willing with qualifications, 17 per cent; not willing, 5 per cent; no response, 21 per cent.

the extremities, and the like at various stages in the medical course, a procedure regarded with general disfavor, detracted from enthusiasm.

Amount taught

The question "Do we teach too much anatomy?" was countered to some extent by the question, "Do we teach too little anatomy?" There was agreement that too many class hours were not being devoted to anatomy, but that possibly too much of the students' time outside of class hours was being demanded. Although the curriculum hours for anatomy have been reduced noticeably in recent years, the teachers admitted that the students are frequently held responsible for mastering the same amount of material as before.

The amount of time at present afforded gross anatomy during the freshman year was regarded as on the whole sufficient; as the questionnaire disclosed, gross anatomy averages around 330 hours (see Table A.1). Curtailment from former longer time allotments has necessitated less detailed dissection than obtained formerly; however, some participants questioned the need for such detailed dissection.

Based on the reports of 87 schools (Figure 1), total required anatomy courses amount to an average of about 622 hours for medical schools in the United States and Canada. The majority of anatomists desire no great change in this number of hours. Students in 82 per cent of the departments complete the formal required instruction in anatomy during the first two years.

Advanced education in anatomy

The anatomists at the Institute agreed that a chief responsibility is to teach material of direct value for subsequent medical courses. The willingness of many to spend considerable time in preparing students to understand clinical problems was underscored in discussion of whether anatomists should provide courses in gross anatomy and neuroanatomy in the later years of the curriculum (see Chapter VII). A minority of the participants thought that attention to specific clinical applications would be distracting and might detract from well-rounded coverage of basic anatomy.

Many anatomists were of the opinion that medical students should have the opportunity to learn more anatomy after introduction to the principles of pathology, medicine and surgery. Several expressed willingness to reduce anatomy time during the first year, provided sufficient opportunity for advanced instruction was afforded during later years.

The questionnaire revealed that many fourth-year students desired more instruction in anatomy in upperclass years. Although more than half of them stated that anatomy courses gave a good background for clinical courses and were helpful in diagnosis, many desired additional courses later in the curriculum (see Table 7.6).

Relation to clinical departments

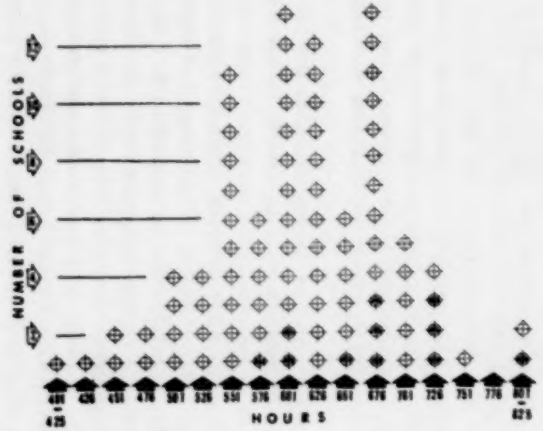
Under present circumstances education in anatomy, after the foundation provided during the first year, must to a considerable extent be the responsibility of clinical teachers "who must bring the foundations of basic anatomy into their teaching." The concept of a "two-way street" was stressed—in which basic science is carried into clinical teaching with participation, insofar as is practicable, of anatomy teachers, and clinical material is brought down into the teaching of the basic sciences. (For more on this see Chapter VII). The problem was thought to have been partly solved in some schools by the introduction of joint appointments in some clinical departments and in anatomy. It had, however, not proven fully effective, and could be disadvantageous if the selections were not made with extreme care.

In discussing the value of having clinicians in various specialties teach anatomy, some reservations were expressed. It was thought preferable to have them teach *in* anatomy rather than teach anatomy.

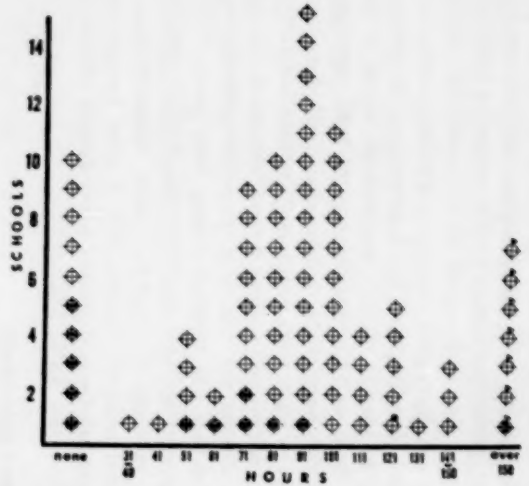
An informal relationship between anatomist and clinician in presentation of clinical material was to be encouraged. A mutual opportunity for correlation of appropriate material would benefit both clinician and anatomist. This would be especially applicable to the internist, because of the relevance of anatomy to diagnosis. The current trend toward reducing the time allotted to anatomy only underscores the importance of maintaining close working cooperation with clinical departments.

It was suggested that anatomy might also be correlated more closely with other basic sciences as well as clinical sciences. Such correlation should be planned and carried out with the approval and participation of each of the different disciplines concerned.

Figure 1
Hours of First-Year Anatomy Offered in Medical School

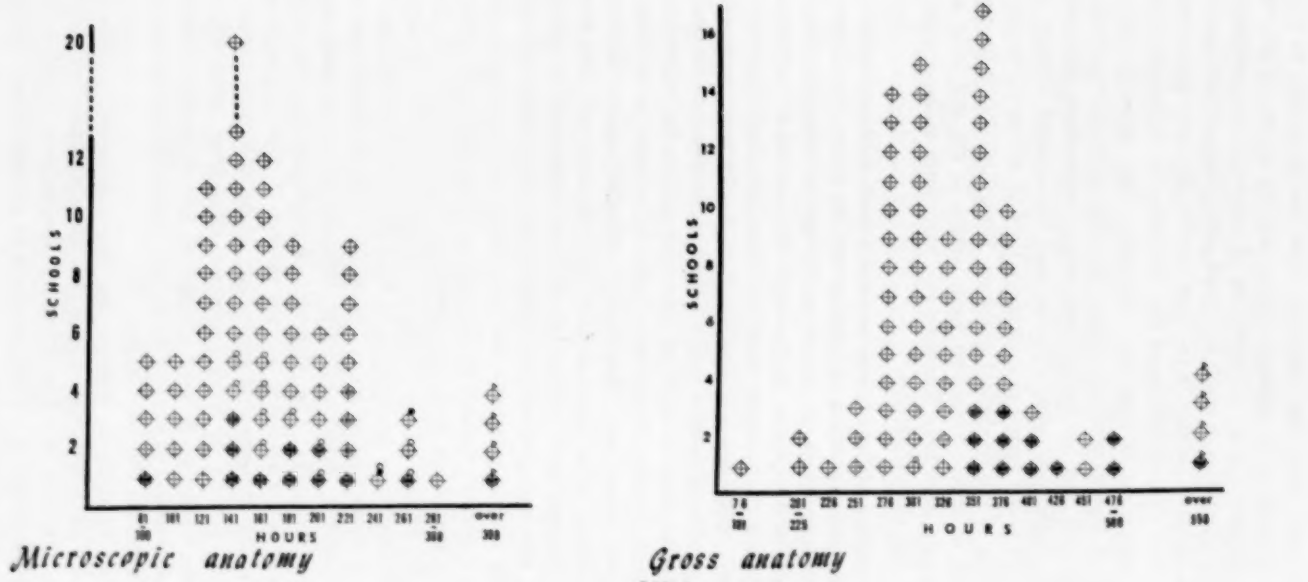


All anatomy courses



Neuroanatomy

Figure 1 (continued)



The point was made that clinicians have an obligation to follow up anatomical teaching with constant review and repetition. In the words of one faculty member: "With the reduction in anatomy time, anatomists have had to devote more time to teaching broad principles and have had to drop many details formerly covered in the long courses. It is now up to anatomists to persuade their clinical colleagues that they have an obligation to continue a student's education in anatomy. No matter how superbly the subject may have been taught, students cannot be expected to have at their fingertips the pertinent and specialized anatomical information they may need in handling clinical problems. This can only be acquired through constant repetition, additional instruction in specialized or advanced anatomy, and the application of this to clinical problems. Even if all details in specialized topographical or applied anatomy were taught in the first year, such information would have been forgotten two years later without some review provided by the clinical teacher."

Factors that might contribute to improvement in anatomy departments

There was some expression of opinion that the change in anatomy teaching has been negative in nature, in conformity to time cuts imposed by changes in other disciplines. Much might be done in a positive sense to reorient anatomy in the newer medical curriculum, including more intensive utilization of the newer techniques (Chapter V) and closer integration with other preclinical sciences and clinical specialties (see Chapter VII).

Many experiments with modified courses or approaches in anatomy have been attempted (Table 1.1; see also Table A.2). Some of the innovations have been quite minor and others have involved all aspects of the medical curriculum. Many of the ventures have been discontinued most frequently because the changes were ineffectual or time consuming. In general, the anatomists were not particularly anxious to experiment with teaching methods. The current programs had apparently evolved soundly and were changing in a gradual manner so that more drastic steps did not seem desirable. Some anatomists were undoubtedly concerned with the objectivty of methods for evaluating the merits of changes in teaching procedures, a factor that undoubtedly contributes to maintenance of established courses.

State board examinations are a factor that will determine some future changes in teaching. Another effective influence in this regard would be the revision of textbooks. The reluctance of publishers to revise adequately such textbooks as are available was the subject of considerable discussion. Some participants thought that anatomists might well assume some of the blame for the paucity of good textbooks, since they, after all, are the authors of the textbooks. A more widespread and outspoken insistence on better textbooks would in the end act to motivate publishers into producing them. (For more on this see Chapter IV).

Much could be done to improve the first-year student's knowledge of human biology and social relationships. Attention was called to a course currently being given at the University of Washington, entitled "Human Growth and Development," which is taught by an anatomist, a physiologist, a pediatrician and a psychiatrist.

Embryology

The role of embryology in present-day teaching aroused lively interest. With the reduction in time allotted to courses in anatomy, embryology as a separate course has been dropped from the curriculum of two-thirds of the medical schools (see Table A.1), and is now usually included in gross or microscopic anatomy.

As descriptive embryology has declined, new areas have opened up in the experimental field. Nutritional, immunological, genetic and biochemical techniques are rapidly being introduced, and the ontogeny of the total organism is being studied. The opinion was voiced that embryology may join with neuroanatomy in the near future as an interdisciplinary course, as is now the case in a few study programs. It was also suggested that embryology might be broadened by being combined with genetics.

To many it appeared strange that decreased emphasis on embryology as a special subject should parallel the growing demand for it from clinical fields. Attention was called to the fact that it is now becoming of critical importance in solving some of the more difficult problems in pediatrics, and it has assumed new relevance to surgery and obstetrics.

According to the questionnaire, a premedical course in embryology was thought extremely desirable by students polled. Embryology was rated high by even more students than was comparative anatomy for its contribution to development of a broad background for future medical studies (see Table 3.2). As part of medical training, nearly a third of fourth-year student respondents considered the amount of embryology taught them inadequate and expressed a desire for additional training in this subject. In contrast, 19 per cent argued for less, with 51 per cent requesting no change (see Table 7.4). Some chairmen of anatomy departments also showed interest in increasing the number of hours devoted to embryology (Table A.1).

Departmental structure

Some consideration was given the question of whether a single anatomy department was preferable to division, for example, into separate departments of histology and gross anatomy, such as exist in three schools (one in United States and two in Canada). Consensus was in favor of a single department that could develop a broad and unified program in all aspects of human morphology. Younger anatomists could acquire broader experience and greater competence when given opportunity to teach both gross and microscopic anatomy.

An additional reason for departmental unity stems from the fact that, at least for the time being, gross anatomy provides fewer outlets for research interests than do histology, neuroanatomy or even embryology. An increasing tendency for these subjects to cross disciplinary boundaries also makes integration logical.

There are admittedly financial considerations in favor of separate departments. In building an adequate staff and procuring an adequate budget, the single department is handicapped in comparison with other departmental budgets when adequate regard is not given the total teaching responsibility. The total number of hours given to anatomy also looms

TABLE 1.2

FACULTY RANKS OF ANATOMY STAFF MEMBERS
(Chairmen group)

Faculty rank	% of staff* (% based on N = 804)
Chairman and professor	23
Associate professor	19
Assistant professor	21
Instructor	22
Fellow	2
Assistant	9
Associate	4
No response (% of total N = 838)	4

*In 88 responding departments.

TABLE 1.3

FULL- AND PART-TIME ANATOMY STAFF BY RANK AND INTEREST
(Chairmen group)

Anatomy staff	Full-time staff %	Part-time staff %	Total staff N = 838	
			% no response	N*
Faculty rank				
Chairman and professor	93	5	2	(184)
Associate professor	90	9	1	(150)
Assistant professor	81	18	1	(172)
Instructor	62	38	0	(173)
Fellow, assistant, associate	26	74	0	(125)
Not known	53	44	3	(34)
Major interest				
Teaching	64	36	0	(201)
Research	85	14	1	(98)
Teaching and research	88	12	0	(280)
Medical practice	0	100	0	(29)
Teaching and practice	0	100	0	(4)
Teaching, research, and practice	0	100	0	(2)
Not usable and not given	65	32	3	(224)

*Representing 88 responding departments.

disproportionately large, for the same reason. Nonetheless, there was no enthusiasm for separate departments.

The questionnaire afforded some interesting statistics relevant to departmental structure. The size of the anatomy faculty roughly parallels the size of the freshman class, with a median proportion of 1 full-time teacher to every 30 students. Optimum ratio suggested by those replying to the questionnaire was 1 to 20 (see Chapter IV and Table 4.15). Among schools reporting, a 50 per cent increase (from 433 to 676) in over-all number of anatomy teachers had occurred since 1946 (see Table A.3).

A comparatively large number of experienced teachers staff anatomy departments. Approximately one-fourth of them are of full professorial rank (Table 1.2), and of these almost all are full-time appointees (Table 1.3).

Budget. Anatomy budgets compare favorably with those of physiology and biochemistry departments, in total amounts allotted (Table 1.4). However, when reckoned on the number of hours of instruction given, anatomy departments are considerably worse off than departments of physiology and biochemistry. School budgets provided salaries for almost all anatomists (Table A.4).

Vacancies. Seventy-one departments reported a total of 86 vacancies in budgeted positions for the 1955-56 school year. In contrast, 37 vacancies were reported by 46 chairmen for the 1945-46 sessions (Table 1.5). (For full discussion of problems of recruitment, see Chapter VI). Only 16 departmental chairmen reported that they thought additional positions were not necessary (see Table A.13).

Research. A large proportion (83 per cent) of departmental chairmen were of the opinion that a department should have a diversity of research interests. Few (7 per cent) thought the department should strive for unity

in a dominant departmental interest. A wide range of research interests is represented in anatomy departments (Table 1.6).

Facilities. Departmental facilities were deemed adequate for current activities by from 52 per cent to 73 per cent of teachers reporting (Table 1.7). Greatest deficiency mentioned was space for research. Needs for space are disproportionately high in comparison with those of some other departments, due to the necessity of maintaining two sets of laboratories, one for gross anatomy and one for other subjects. In a majority of schools, (72 per cent) laboratories are used for a variety of additional purposes during the year, including courses for nurses, or special work in pathology and neuroanatomy, and examinations. But even with this, anatomy laboratories are utilized little more than half the year. Although this is a problem common to all science departments, it pertains more to anatomy departments than to some others.

Departmental diversification required

While a common complaint against anatomists has always been that "they teach too much about too much" (and few outside the field know how much has actually been dropped from modern courses), they are expected by other departments to provide the essential information in gross anatomy, histology, neurology and embryology without regard to the range and diversity of these subjects. The breadth of the field of anatomy was thought to be insufficiently realized. Competency in all four of these aspects of anatomy is beyond any one individual. Consequently anatomy staffs frequently must include specialists in gross anatomy, histology and neurology. In addition to providing expert instruction, such specialists are essential for advanced training of graduate students and young instructors.

TABLE 1.4

BUDGETARY ALLOTMENTS IN FIVE MEDICAL SCHOOL DEPARTMENTS
(Deans group)

Budgetary allotment	No. schools reporting in each interval			
	Anatomy* (Total N = 78)	Physiology (Total N = 78)	Pathology (Total N = 78)	Biochemistry (Total N = 78)
Dollars per student				
$ 1 - 250	5	7	4	5
251 - 500	10	21	18	29
501 - 750	26	25	19	23
751 - 1000	22	12	6	8
1001 - 1500	7	4	18	2
1501 or more	0	0	3	0
Range	$54.14— 1370.00	$59.69— 1250.00	$59.70— 4040.00	$34.23— 1230.00
Median	$680	$570	$660	$500
No response	9	9	10	11
Dollars per hour				
$ 0 - 50	9	3	4	5
51 - 100	28	10	11	3
101 - 150	19	17	14	15
151 - 200	7	16	8	21
201 - 250	5	7	13	6
251 - 300	1	6	9	6
301 - 500	1	8	6	9
501 - 1000	0	2	2	1
1001 or more	0	0	1	0
Range	$0.85— 388.50	$1.40— 751.00	$1.13— 3101.00	$1.60— 520.00
Median	$100	$160	$180	$170
No response	8	9	10	12

*For dollars per student the responding N for Anatomy was 70, not 69, because one dean reported freshman and sophomore data separately.

TABLE 1.5

BUDGETED VACANCIES IN ANATOMY DEPARTMENTS FOR THREE YEARLY PERIODS 1945-56

(Chairmen group)

Vacancies by rank	1945 - 1946 period			1950 - 1951 period			1955 - 1956 period		
	No. depts. with given vacancies	Total vac. at each rank	Ratio of no. vacancies to 46 resp. chairmen	No. depts. with given vacancies	Total vac. at each rank	Ratio of no. vacancies to 55 resp. chairmen	No. depts. with given vacancies	Total vac. at each rank	Ratio of no. vacancies to 71 resp. chairmen
Professor		2			3			6	
1 vacancy	2			3			4		
2 vacancies	0			0			1		
Associate professor		4			6			11	
1 vacancy	2			4			9		
2 vacancies	1			1			1		
Assistant professor		5			9			17	
1 vacancy	3			7			15		
2 vacancies	1			1			1		
Instructor		12			19			20	
1 vacancy	4			11			12		
2 vacancies	2			2			2		
4 vacancies	1			1			1		
Assistant		7			6			5	
1 vacancy	2			4			5		
2 vacancies	0			1			0		
5 vacancies	1			0			0		
Graduate student		7			12			27	
1 vacancy	1			4			5		
2 vacancies	3			4			5		
3 vacancies	0			0			2		
6 vacancies	0			0			1		
TOTAL		37	.8		55	1		86	1.2

TABLE 1.6

AREAS OF RESEARCH INTEREST IN ANATOMY DEPARTMENTS
(Chairmen group)

Area	Per cent of departments (N = 90)			
	Major research interest	Minor research interest	No research interest	No response
Cytology	52	21	6	21
Electron microscopy	23	13	28	36
Tissue or organ culture	22	21	23	34
Histochemistry	53	23	6	18
Radiobiology	23	20	26	31
Embryology	44	19	17	20
Experimental embryology	38	15	21	26
Morphology	47	15	17	21
Experimental morphology	33	14	17	36
Physical anthropology	18	17	35	30
Endocrinology	53	16	8	23
Neuroanatomy	74	11	6	9
Neurophysiology	40	20	17	23
Other	38	5		57

TABLE 1.7

ADEQUACY OF PHYSICAL FACILITIES FOR DEPARTMENT NEEDS
(Chairmen group)

Department need	Per cent of departments (N = 90)		
	Physical facilities are:		
	Adequate	Inadequate	No response
Instruction in anatomy	73	26	1
Present staff offices	71	29	0
Research laboratories	52	47	1
Budgeted vacancies	44	23	33
Additional personnel desired but not now budgeted	37	40	23

It was thought desirable to have a departmental staff with diversified interests in areas such as histochemistry, neurophysiology, gross anatomy, etc., all cooperating as members of one anatomy department. Furthermore, the different techniques should be correlated and integrated as much as possible in the presentation of the basic courses.

Likewise not well understood by other faculty members is the allied problem, that anatomists are expected to teach subjects quite apart from daily investigative interests. Men doing research in various fields of microscopic anatomy, for instance, are at the same time expected to instruct in gross anatomy. This is a problem peculiar to anatomy. For the most part, men in other disciplines teach material that is more closely allied with their personal research and daily routine.

Additional preoccupation with professional or technical instruction is also required of anatomists who may have responsibilities for teaching dental, nursing or other students in the health sciences, as is the case in 35 medical schools (see Table A.5).

Since this Teaching Institute was concerned chiefly with medical education, little consideration was given to courses other than those for medical students, except for comment to the effect that added responsibility requires additional personnel, facilities and budgets.

More than half of the departmental chairmen polled by the questionnaire felt that dental and other health science students should be taught by the

TABLE 1.8

EXPERIENCE OF TEACHERS OF DENTAL STUDENTS
(Chairmen group)

Departments classified by dental experience of teachers (Responding N = 51)	N	Per cent of chairmen citing opinion on value of dental experience			
		Desirable	Undesirable	Doubtful	No response
No experienced teachers (29%)	15	66	27	7	0
One or more experienced teachers	15	93	0	7	0
1 teacher (20%)					
2 teachers (6%)					
3 teachers (2%)					
4 teachers (2%)					
No dental school (41%)	21	14	5	0	81
No response (43% of total N = 90)	39	10	3	0	87
TOTAL	90	34	7	2	57

same department that teaches medical students. Only 25 per cent thought that dental instruction should be handled separately, and that the anatomy department should not be responsible for teaching dental students. The majority of departmental chairmen (59 per cent) thought that a different approach was required for teaching dental and other health science students, primarily because of their different interests, objectives and backgrounds. Although it was considered desirable that those teaching dental anatomy (Table 1.8) have some experience in dentistry, relatively few teachers had such experience.

In many schools anatomists are further called upon to provide postgraduate instruction for hospital residents and physicians in practice (see Chapter VII). This demand is frequently greater than any made upon other preclinical specialists except pathologists. Since anatomists, unlike pathologists, are not a part of the hospital staff, postgraduate teaching entails a separate and specially organized course of instruction. This means either an increase in personnel or an unduly heavy load on the department.

Relationship to the university

A closer relationship should be sought between the department of anatomy in a medical school and the department of biology in the university. It was hoped that the medical school might come to be considered more and more as an integral part of the university rather than as a separate division. An obstacle to this, it was conceded, is the limitation, in many schools, on the use of anatomical material outside the medical schools. A number of schools however have anatomy courses for some undergraduate groups (see Table A.5) and for graduate students.

The idea was repeatedly expressed that anatomy departments could best discharge their duties through adherence to the high standards expected of them as a division of a university: by promoting scholarship, contributing to the advance of scientific knowledge through research, and teaching at a graduate level. Our first responsibility is the "maintenance of a university atmosphere in which the development of attitudes and character and a curiosity for pursuit of knowledge for its own sake, not merely the production of skilled technicians, is paramount."[2]

[2]LIPPARD, VERNON W.: *J. Med. Educ.* 30:700, 1955.

II

Anthropology in Medical Education[1]

Gabriel W. Lasker

THE MAJORITY of medical students meet little anthropology in medical school and have had no courses in the subject previously (Table 2.1). Nevertheless, from the questionnaires it is clear that many anatomists and a majority of the deans and especially the medical students consider anthropological subjects to be of importance to medical education.

TABLE 2.1

ASPECTS OF ANTHROPOLOGY STUDIED IN PREMEDICAL COURSE WORK

(Student group; Multiple response)

Course	% of medical students reporting on premedical course work	
	First year students (N = 700)	Fourth year students (N = 500)
General anthropology	11	14
Physical anthropology	4	5
Cultural anthropology	12	11
Human genetics	20	29
Other	5	3
None	65	59

The questions which remain, therefore, are only what aspects of anthropology would be worth while, how could they fit into medical education, and who can present them?[2]

The subjects included under medical anthropology were arbitrarily grouped under the rubrics human evolution, human genetics, human growth, human variation and human culture. Anthropologists are not the sole students of any of these topics and these topics are not the only subjects of anthropology. Because of overlapping with anatomy and medicine, this panel was planned to summarize what is going on in anthropology and the extent and directions in which the present modest contributions of the handful of anthropologists in medical schools could profitably be supplemented.

Human evolution

Some teachers of anatomy may think that, in the past, simple comparative anatomy of contemporary species has been overworked in premedical

[1]The topic, "Anthropology in Medical Education," was handled as a panel presentation at the Institute. The talks of the other members of the panel are included in the Appendix.

[2]W. W. Greulich, in "Anthropology as an Ancillary Medical Science," gives his answers to such questions on pages 132-5, Appendix D.

courses. However, more recent emphasis by anthropologists has been on whole functional systems. Such systems rather than isolated traits are the units of natural selection—hence the anthropologist's attention. For instance, Dr. S. L. Washburn has emphasized the related results of diminished masticatory function in reduction in size of the teeth, of alveolar processes, of facial prognathism, of the region of the gonial angles, of zygomatic arches, and of sagittal crest and other structures attached to, supporting, or resisting the forces of the muscles of mastication. Such views stem from seeing evolutionary trends in the light of analyses of experiments: severing the mandibular nerve or one of its motor branches, biomechanical studies of bone, and intravital staining. The functional systems thus revealed are also the units of significance to medicine, and similar analyses can be applied to understanding malocclusion or mandibular fractures.

Physical anthropology is thus converging toward anatomy. Although the problems sometimes may differ, many of the experimental techniques of the anthropologists were learned in the anatomy or zoology laboratory. One purpose of these studies is to define the natural units of locomotor activity, growth activity and genetic activity. This purpose is as pertinent to other anatomical questions as to the revolutionary problem to which the anthropologist may have initially directed his studies.

A few years ago I had the pleasure of hearing a distinguished anthropologist explain the bone, muscle and nerve relationships of the human limbs to a class of freshmen medical students. He explained that morphological flexors originate from morphologically ventral parts of the skeleton and are innervated by nerves from ventral parts of the plexuses; that, in general, pre-axial muscles have more cranial spinal innervation than post-axial, but that at the same time the more distal the muscle the more caudal the spinal level of its innervation. However, to demonstrate the primitive morphological arrangements and to explain the apparent exceptions required examples from simple tetrapods and a description of the evolution of human posture through torsion of the limbs. His use of evolutionary and developmental concepts and introduction of comparative and embryological data greatly facilitated the students' grasp of similarities and differences between upper and lower limbs in respect to the patterns of muscle innervation. For this the general concept of the "vertebrate limb" proved a more useful natural unit of initial explanation than the restricted concept of the adult "human arm" or "leg." Many outstanding anatomists draw on experimental anthropology to teach gross anatomy.

Human genetics

When, in 1872, Charles Darwin wrote "The laws of inheritance are for the most part unknown," Gregor Mendel's classic report setting forth some of these laws had been published for 6 years. Ironically enough, a book by Hermann Hoffmann which referred to Mendel's publication had apparently already been read by Darwin himself. In any case, it remained another 28 years, until 1901, for Mendel's law and his work to be rediscovered and still longer for others to combine evolutionary and gene theories. Only in

recent years has evolution come to be defined as "a change in gene frequencies within a breeding population." Today anthropologists group the numerous circumstances which can effect human evolution into four factors which play on gene frequencies: (1) purely random chance variation, (2) intermating, (3) mutation, and (4) natural selection.

The use of pedigree studies in medical genetics is as old as modern genetics and dates from 1902 when A. E. Garrod recognized Mendelian recessive ratios in human hereditary traits, alkaptonuria, albinism and cystinuria. Today anthropologists in medical colleges are contributing answers to a new set of problems, those of medical population genetics. Sickle-cell anemia, for instance, is a disease very common among Negroes. Nearly one in ten American Negroes is heterozygous for the gene for sickling and hence nearly one per cent of Negro marriages may produce offspring with this disease. The question arises: "How can such high frequencies of a gene be maintained in a population when the homozygous recessive individuals so rarely survive the anemia long enough to reproduce?" One or more of the four factors must be invoked: (1) It could hardly be chance. (2) It could be intermating of whites with Africans. The European gene frequency is very low and some African groups have very high frequencies of sicklers, but this only pushes the problem back to an explanation of the even higher frequency of this gene in Africa. (3) To explain the frequencies by recurring mutation would require a further explanation of why it has occurred so much less often in Europe than in parts of Africa and India. (4) It now seems that the losses due to reduced reproduction by homozygous (anemic) sicklers are in balance with a favorable selection for heterozygous sicklers who, in areas of endemic malaria, apparently have a degree of constitutional immunity to the disease.

Growth

Genetic factors only show themselves in individual development. The anthropologist's study of growth usually begins where the embryologist's ends. The anatomist's should encompass both. At birth the organs of the body are well established, but it may be important for the physician to understand why there is still time in postnatal growth for considerable individual variation in the relative growth of different parts of the body. Differential growth is of interest to the pediatrician, obstetrician, orthopedist, orthodontist, and indeed to all physicians.

From records of changes in height and weight alone, deviant patterns would indicate that something was amiss in the development of most children with endocrinopathies or nutritional disturbances and in some other diseases. Nevertheless, only in a few of these cases is the atypical growth the most significant sign to the physician. On the other hand in malocclusion of the jaws or in cleft palate, for instance, the choice of treatment and its timing may depend on the prediction of future growth. The physician or dentist may not only need to know of recent research findings of anthropologists, but he may well profit from acquisition of the skills of accurate measurement of individual growth by anthropometry or x-ray cephalometry. Growth is a broad field, and there are various emphases, but most

anthropologists teaching about growth to medical students emphasize the relative growth of different parts or tissues; and all lay stress on individual differences in the growth process. Such differences in growth have both hereditary and environmental causes.

Culture[3]

The reference to external environment brings one directly to the wider interests of general anthropology, indeed of social science. Consideration of the sociocultural setting of the patient is often of critical importance to his recovery. This is almost a platitude: every physician knows examples of patients whose social problems are more urgent than their physical ones. There is also the question of the social relations between patients and doctors. An attitude of humane interest in the patient has proved insufficient by itself; it is now widely felt that there must be genuine, if necessarily limited, understanding of his personality and background. There may be value in exposing the medical student to the objective study of man's social environment both in his premedical years and again during his professional training. This theme would warrant a whole symposium and Dr. Paul has touched on a few questions which such a symposium might explore.

Among those presently involved in medical teaching about cultural differences are social workers, psychiatrists and many clinicians, besides anthropologists. Besides the professionally trained, there are acquaintances, fellow students, and all those who open the student's eyes to the variety of ways of life by which we humans live. Medical men, not without justice, sometimes complain that social scientists are prone to introduce considerations which, however relevant to the efficiency and happiness of individuals, have little direct bearing on the particular problems of ill health, acute disease, physical malformation or mental distress that call for immediate remedial effort. But, on the other hand, the medical student may become so absorbed in the physical condition and symptoms of the individual patient that he fails to recognize him as a social being.

Variation[4]

Perhaps the chief gap between the medical and the anthropological point of view—indeed between the clinical and the academic viewpoint—is the concern of the former with the individual and the latter with the general. But I see the gap as closing. Advance in medicine depends on the ability to generalize. And anthropology, although attempting generalizations about man, also recognizes that modes of human behavior are the result of unique events, although the events in turn are the product of regular processes subject to more or less accurate prediction. "Variate" in anthropology is a verb. I doubt that it is a noun to any anatomist today. We are concerned with processes. As Dr. Angel has said, a series of static types defined by

[3]See "Medicine's Third Dimension" by Benjamin Paul (Appendix D, pages 137-40.)

[4]J. L. Angel considers this topic in "Anthropology and Human Variation" (Appendix D, pages 135-7.

averages of measurements no longer suits our needs. A study of the interplay of intrinsic and extrinsic factors in human variation will be rewarding to students of anthropology, and to students of medicine. The anthropologist's consideration of the role of age, sex, species, individual genetic makeup, and physical and social environment on human variation will be of value to the student of medicine. The spuriously sharp division between the pathological and the normal will be seen for what it is, an arbitrary dividing line created by physicians. A preliminary look across that line is the object of most of the beginning medical courses.

Significance to medical education

What is the relative value to medical education of the various topics of which I have been speaking? In the light of their knowledge of the topics, more of the deans who responded to the questionnaire would consider adding a person to deal with human genetics than with any of the other topics and then, in decreasing order, growth, culture, constitution, variation and evolution. This is exactly the order in which the medical students rated the value of these topics in orienting them to medical studies except that they would place variation third. The discrepancy is probably due to the fact that, as indicated in the answers to another question, present staffs are adequate to deal with variation. I would certainly put this topic first in importance if a broad definition is given to the term. In a sense it incorporates all the other topics. The questionnaires show that variation is at present more often included than the other subjects (Table 2.2).

In what department does anthropology fit into the medical school? One might wish to see anthropology utilized in various departments. Genetics, for instance, has an important place in obstetrics and obstetricians are usually the persons called on for genetic counseling. For minimum disruption of present practices, however, these developments usually would grow most easily out of the anatomy teaching. Eighty-three per cent of anthropologists in medical schools are members of departments of anatomy. The majority of deans believe that all the topics except social relations and human growth best fit into the program of the anatomy department and many put growth there as well as in pediatrics (Table 2.3).

Does all of this imply that, in the medical curriculum, more time than is now usual should be allotted to anthropological topics as such? And should anthropology be squeezed into the time set aside for anatomy? I very much doubt it because, as I have tried to show, that would not really serve the purpose. To color anatomical and other medical teaching with the anthropological viewpoint will take integration with more traditional materials and this integration can be expected to occur in the minds of persons who know considerable anthropology. In some cases, choice of anthropology as an optional premedical subject benefits a student, but in general it takes the more mature scholar, the medical teacher, to lead in correlating the subjects. I therefore think it especially useful to medical students to have individuals trained in anthropology on medical faculties. Should these be primarily anthropologists with special experience in anatomy or anatomists with some

TABLE 2.2

ASPECTS OF ANTHROPOLOGY ACTUALLY STUDIED AND CONSIDERED DESIRABLE IN MEDICAL EDUCATION

(Four groups)

Responding group & question asked	Number		% of each group responding to questions on 6 areas											
			Human Constitution		Human Evolution		Human Genetics		Human Growth		Human Variation		Social Relations*	
	Responding	Total	Actual	Desirable	Actual	Desirable	Actual	Desirable	Actual	Desirable	Actual	Desirable	Actual	Desirable
Participants:														
Which subjects are given more than passing mention?														
Response	(83)	87	46		34		51		69		81			
Deans:														
For which areas would maintaining a staff member be desirable?														
Response	(78)	78		58		45		83		79		56		63
Students:														
In which areas would knowledge have been helpful in orienting you to your medical studies?														
1st year response	(643)	666		45		35		57		53		49		50
4th year response	(496)	529		38		27		69		60		49		48

*Not asked the participants group.

TABLE 2.3

MEDICAL SCHOOL DEPARTMENTS TEACHING ANTHROPOLOGICAL SUBJECTS
(Deans group; Multiple response)

Department	Per cent of schools in which subject is taught by department listed at left					
	Human Constitution	Human Evolution	Human Genetics	Human Growth	Human Variation	Social Relations
Anatomy	50	63	45	52	53	2
Medicine and Internal Medicine	29	0	15	2	12	21
Pediatrics	13	0	8	68	20	7
Psychiatry	8	1	4	14	14	45
Public Health	3	0	6	0	0	41
Other or combination of other departments	44	39	54	13	48	30
Responding N	(38)	(35)	(53)	(66)	(49)	(58)
No response (% of total N =78)	51	55	32	15	37	26

acquaintance with anthropology? The anthropologist, at least at first, may find his teaching handicapped by unfamiliarity with the enormous accomplishments of anatomy. This was my own experience. The anatomist, however, will have to be alert if his study of anthropology is to yield more than a few little techniques; only to the extent that he has grasped the role of cultural and genetic factors in the growth and evolution of a very varied mankind, will he be equipped to use these topics meaningfully in medical education. In view of the foregoing evidence I hope that colleges of medicine and departments of anthropology will jointly create educational opportunities for new personnel interested in a career which will bring these aspects of anthropology which are relevant into anatomy and into other courses in medical school.

III

Preprofessional Preparation for Anatomy

While it is hoped that the advances in the requirements for admission to professional schools, leading as it does to observational work in physics, chemistry and biology preliminary to the work of the medical courses, will bring the students to our laboratories of anatomy better prepared than hitherto for independent observation of anatomical structures, there can still be but little doubt that many students will learn how really to study and observe first in the dissecting room. F. P. MALL, 1905.

IN PLANNING THIS session of the Institute, the members of the topic subcommittee were necessarily concerned not only with anatomy but with general preprofessional preparation for a career in medicine. This dual concern was reflected both in agenda and questionnaire, as well as in discussion sessions. Certain discussions and questionnaires were directed solely towards preprofessional preparation for anatomy, e.g., the relative value for anatomy in medical school of such college courses as embryology, comparative anatomy and genetics (Tables 3.1, 3.2). Others involved the over-all philosophy of premedical education.

The subcommittee's concern with this over-all philosophy, focusing on freedom of choice of subject matter by the student, led it to define a liberal education as one which expresses most fully the capacities and preferences of the student. It was thus led to inquire through the questionnaires about the pressures to which the student and his undergraduate advisers are subjected, and about the influence which such pressures have upon his preparation for medicine and upon his attitudes and characteristics when he enters medical school.

Definition of a liberal education

There was general agreement among the participants at the Institute that preparation for medical school should be in terms of a broad liberal education. However, there was a wide range of opinion as to the meaning of a liberal education and the curricula which would provide it. Some accepted the topic subcommittee's definition of a liberal education and favored a free choice of scientific and nonscientific courses beyond a few minimal requirements. Those students wishing to emphasize the humanities and social sciences should be permitted to do so; those preferring a major experience in science should again be given free rein. Others accepted liberal education as implying broad grounding in liberal arts. Some participants held that since many science courses have a high cultural value, a premedical course should be prescribed on a broad basis with more emphasis on science and

TABLE 3.1

STUDENT REASONS FOR TAKING COURSES
(Student group)

Primary reasons for taking courses	Per cent of students citing reasons for taking courses*									
	A	B	C	D	E	F	G	H	I	J	K
	First year students										
1. Required for major	37	32	28	26	26	20	28	28	33	8	27
2. Believed it would prepare me better for first-year anatomy	32	29	40	13	11	21	5	4	9	2	
3. Believed it would help me get into medical school	12	13	9	7	6	4	4	3	6	2	8
4. Nothing else of interest available	†	0	†	1	2	2	2	3	1	4	1
5. Took it out of interest in the broad zoological field	7	8	7	18	21	8	22	24	7	17	17
6. Was a prerequisite for another course; otherwise I would not have taken it	1	1	1	2	2	6	1	3	1	1	3
7. Specific interest in the course itself	5	11	11	29	21	23	34	32	36	60	29
8. Other	6	5	3	3	9	10	4	1	6	4	8
No primary reason indicated	†	1	†	1	2	6	0	2	1	2	0
Responding N	(565)	(512)	(236)	(275)	(47)	(51)	(354)	(104)	(143)	(119)	(335)
Did not take course (per cent of total N = 700)	18	24	60	55	85	83	44	75	72	72	1
No response or not usable (per cent of total N = 700)	2	3	6	6	9	10	5	10	8	11	51
	Fourth year students										
1. Required for major	42	39	38	31	32	31	28	16	43	8	30
2. Believed it would prepare me better for first year anatomy	30	27	34	14	6	9	9	3	8	6	5
3. Believed it would help me get into medical school	9	8	7	4	5	11	6	2	10	2	4
4. Nothing else of interest available	†	†	†	1	2	0	1	1	1	8	2
5. Took it out of interest in the broad zoological field	8	12	9	23	29	24	22	35	7	22	18
6. Was a prerequisite for another course; otherwise I would not have taken it	2	1	†	1	0	2	1	1	2	1	4
7. Specific interest in the course itself	4	11	10	24	26	16	29	39	26	49	30
8. Other	4	2	1	2	0	5	3	3	3	2	6
No primary reason indicated	1	†	0	†	0	2	1	0	†	2	1
Responding N	(472)	(402)	(227)	(248)	(65)	(63)	(277)	(91)	(183)	(106)	(197)
Did not take course (per cent of total N = 560)	13	24	54	50	78	78	44	74	59	70	2
No response or not usable (per cent of total N = 560)	2	4	6	6	10	10	6	9	9	11	63

*Course:
A. Comparative anatomy
B. Embryology
C. Histology
D. General physiology
E. Cellular physiology
F. Cytology
G. Genetics
H. Evolution
I. Biochemistry
J. Anthropology
K. Other courses in Zoology

†Less than 1% response.

less free choice. Still others thought that a survey course presenting the history of development of scientific and philosophical ideas would be a highly desirable part of a liberal arts program. In medicine and other professions, it was observed, the better students come from colleges providing a basically cultural education rather than from schools with "practical training" programs. Finally, the participants were reminded that, while well-rounded men with a liberal education are desired, quality in the end depends more upon the individual—his intelligence, judgment, integrity and responsibility—than upon the courses taken in college.

Three vs. four years

Some participants pointed out that a three-year premedical course lessens opportunity for attainment of a broad liberal education. This led to discussion of the value of the fourth year. Majority opinion was that the fourth year should be retained because of its potential contribution to the social

TABLE 3.2

STUDENT RATINGS OF COURSE VALUE
(Student group)

Course and rating*	Courses rated as preparation for medical anatomy						Courses rated as broad background for medicine					
	1st year students (N =700)			4th year students (N =560)			1st year students (N =700)			4th year students (N =560)		
	% citing rating	Responding N	No response†	% citing rating	Responding N	No response†	% citing rating	Responding N	No response†	% citing rating	Responding N	No response†
Comparative anatomy												
0	3			7			6			8		
1	20			25			17			25		
2	31			31			33			29		
3	46			37			44			38		
Average rating	*2.3*	(648)	7	*2.0*	(533)	5	*2.2*	(619)	12	*2.0*	(501)	10
Embryology												
0	3			6			3			7		
1	16			21			11			18		
2	28			34			27			35		
3	53			39			59			40		
Average rating	*2.5*	(630)	9	*2.1*	(524)	6	*2.4*	(616)	12	*2.1*	(492)]	12
Histology												
0	7			14			10			17		
1	21			21			21			22		
2	30			29			32			28		
3	42			36			37			33		
Average rating	*2.1*	(550)	21	*1.9*	(498)	11	*2.0*	(623)	25	*1.8*	(473)	16
General physiology												
0	20			17			5			8		
1	34			22			12			11		
2	28			28			35			23		
3	18			33			48			58		
Average rating	*1.4*	(529)	24	*1.8*	(473)	16	*2.3*	(527)	25	*2.3*	(482)	14
Cellular physiology												
0	45			34			15			17		
1	35			40			38			33		
2	16			19			32			30		
3	4			7			15			20		
Average rating	*.8*	(428)	39	*1.0*	(449)	20	*1.8*	(441)	37	*1.8*	(461)	18
Cytology												
0	39			36			16			24		
1	38			41			40			42		
2	17			18			35			24		
3	6			5			9			10		
Average rating	*.8*	(437)	36	*.9*	(448)	20	*1.4*	(438)	37	*1.8*	(452)	19
Genetics												
0	50			39			4			5		
1	33			35			19			21		
2	14			19			39			41		
3	3			7			38			33		
Average rating	*.7*	(543)	22	*.9*	(477)	15	*2.1*	(564)	19	*2.0*	(490)	13

(Table continued on page 35)

TABLE 3.2 (continued)

STUDENT RATINGS OF COURSE VALUE

(Student group)

Course and rating*	Courses rated as preparation for medical anatomy						Courses rated as broad background for medicine					
	1st year students (N = 700)			4th year students (N = 360)			1st year students (N = 700)			4th year students (N = 360)		
	% citing rating	Responding N	No response†	% citing rating	Responding N	No response†	% citing rating	Responding N	No response†	% citing rating	Responding N	No response†
Evolution												
0	45			43			10			12		
1	38			37			37			35		
2	13			15			32			31		
3	4			5			21			22		
Average rating	*.8*	(467)	33	*.8*	(456)	19	*1.6*	(489)	30	*1.6*	(470)	16
Biochemistry												
0	52			47			8			11		
1	22			25			18			16		
2	12			14			30			30		
3	14			14			44			43		
Average rating	*.9*	(478)	32	*1.0*	(472)	16	*2.1*	(492)	30	*2.0*	(476)	15
Anthropology												
0	48			41			7			8		
1	35			37			29			25		
2	13			18			36			36		
3	4			4			28			31		
Average rating	*.7*	(456)	35	*.8*	(444)	21	*1.8*	(471)	33	*1.9*	(468)	16
Other												
0	45			51			5			6		
1	24			26			26			22		
2	14			11			32			40		
3	17			12			37			32		
Average rating	*1.0*	(192)	73	*.8*	(74)	87	*2.0*	(191)	73	*2.0*	(78)	86

*Ratings range from 0 to 3 with 0 indicating no importance, 3 indicating maximum importance. Per cents are based on responding N.

†No response = % of total N.

and cultural background and to the maturity of the student. One participant contended, however, in this regard that it had yet to be demonstrated that the senior year in college contributed significantly to "liberal education." He pointed out that in most undergraduate schools, the fourth year was one of extreme concentration.

Admission policies detrimental

There were those who thought that, wittingly or unwittingly, admission policies of medical schools interfere with the student's attainment of a liberal education, and create social deficits in a student's over-all medical education that sometimes are not revealed until the clinical years when he is dealing with patients. When a school appears to favor students with more adequate preparation in the natural and physical sciences, or fosters the idea that such students will perform better in medical school, it inevitably strengthens the appeal of such courses for medical school aspirants. In addition, many students apply to more than one medical school and in preparing themselves to meet the differing requirements of the several schools, find little opportunity for broad liberal arts courses.

The discussants were prepared to admit that anatomists share responsibility for adding to the restriction of choice of the premedical student, by implying to first-year classes that they are expected to be familiar with the tools and context of advanced biology courses. When this information gets back, often in garbled form, to the premedical adviser, he hesitates to counsel students will perform better in medical school, it inevitably strengthens the of getting into medical school or their academic performance afterwards. It was suggested that it might be advisable for medical schools to list only those courses absolutely required, and leave the remainder an open choice, in the hope that premedical advisers would guide the student in choice of electives. Once courses are listed by medical schools as highly desirable, there is the danger that such recommendations appear as mandates.

Cultural vs. scientific requirements

How far can the admission committees of medical schools go in accepting students who have concentrated in the humanities and social sciences? As might be expected, there was divergence of opinion on this point. Some expressed the view that admission committees should be encouraged to admit exceptional individuals who do not comply with admission requirements, even to the point of accepting a rare individual who has had no biology. Most of the discussants, however, favored some background in biology. They pointed out that a complete lack of biology might well indicate a basic lack of interest in medicine as a career; that a student could not properly select medicine as a career without some biological background; and that admission of a student inadequately grounded in science might jeopardize his satisfactory performance in medical school. There was wide agreement that evaluation of an applicant's suitability for medical school should be based not on the number of science courses taken but on his performance in those he did take. Competent students will handle satisfactorily any discipline that is interestingly presented regardless, within wide limits, of their background.

In summary, the participants in the Institute expressed the following views: (1) that a liberal premedical education, variously defined, is highly desirable; (2) that four years of undergraduate college education are preferable to three; (3) that medical schools and their departments should guard against creating the impression that a heavy scientific background is essential, however desirable it may be in individual cases; and (4) admission committees of medical schools should be encouraged to accept promising students even though they may not have completely fulfilled admission requirements in science.

Questionnaire disclosures

How do replies to the questionnaires compare to the view of the participants at the Institute? Do the admission requirements of medical schools detrimentally affect a liberal education? What are the reasons given by students for taking courses in college closely allied to courses which would be taken in medical school? Do students report significant differences between their actual and preferred field of concentration in college? Do medical students believe that there have been deficiencies in their undergraduate education and if so, what are these deficiencies? Are there a sufficient number of students who enter medical school at the end of three years rather than four to make this a problem in achieving a liberal education?

As shown in Table 3.3, numerous pressures that affect the acquistion of a liberal education by premedical students are mentioned by undergraduate deans as arising from medical school admission policies. The single most important pressure is that originating from requirements of, or preference for, a heavy science background. Next come those pressures that arise from the students' attempts to fulfill heterogeneous requirements of several medical schools, from choice of science electives to improve chances of admission, and from acceptance by medical schools of students after only three years of college. At present, however, according to the questionnaire, undergraduate deans are not seriously concerned about detrimental effects that

TABLE 3.3

EFFECT OF MEDICAL SCHOOL ADMISSION POLICIES ON LIBERAL PREMEDICAL EDUCATION
(Undergraduate deans group)

Are admission policies detrimental to liberal education?	% response classified by school enrollment			Total %
	Less than 3000	3000 to 10,000	Over 10,000	
Yes	25	34	34	30
No	70	61	50	63
Yes and no	3	3	8	4
No response	2	2	8	3
Total N	(57)	(62)	(26)	(145)

Opinion of deans citing detrimental policies	% citing factor
Limiting factors in course selection	
Requirements of or preference for heavy science background	44
Allowing a three-year program	14
Choice of science electives to improve chances of admission to medical school	10
Too many specific and restrictive requirements	6
Grade-consciousness of student	4
Medical schools seek recommendations from science faculty	4
Student attempts to fulfill heterogeneous requirements of several medical schools	4
Other	14
Responding N	(50)

TABLE 3.4

COINCIDENCE OF ACTUAL AND PREFERRED FIELDS OF CONCENTRATION

(Student group)

Actual and preferred premedical fields were:	% of 1st yr. students (N = 700)	% of 4th yr. students (N = 560)
Same	45	40
Different	52	57
No response to one or both parts of question	3	3

TABLE 3.5

STUDENT PREFERENCES IN FIELDS OF CONCENTRATION

(Student group)

Areas of premedical concentration	% of 1st yr. students (N = 700)		% of 4th yr. students (N = 560)	
	Actual	Pref.	Actual	Pref.
Biological sciences	51	42	49	35
Foreign languages	†	†	†	1
Humanities	5	15	6	23
Mathematics	2	6	3	6
Physical sciences	30	21	27	13
Social sciences	6	13	6	18
Other	3	2	6	3
No response	2	1	3	1

†Less than 1 per cent response.

medical school admission policies may have had on the acquisition of a premedical education.

Primary reasons indicated by first- and fourth-year medical students for taking college courses in biological science appear in Table 3.1. For sake of simplicity comment will be made here only on those subjects (comparative anatomy, embryology and histology) most closely related to subject matter presented in the anatomical department of a medical school. About a third of the students took these courses because they were required for a major. Approximately an equal number took them in the belief that they would better prepare them for first-year anatomy. About 10 per cent believed they would help them get into medical school. On the average, less than 15 per cent took them because of specific interest in the course itself or because of interest in the broad zoological field. In line with this evidence, fewer than half of the students indicated that their actual major coincided with their preferred fields of concentration in college (Table 3.4). Whereas 50 per cent of the students queried had actually majored in biological sciences in college, only 38 per cent considered this their "preferred field" (Table 3.5). Although the plea was made for students to have a broad premedical education, the fact remains that the preponderance of premedical advisers is found in chemistry, biology, physics and psychology.

Of the first- and fourth-year medical students, 65 per cent and 71 per cent respectively, expressed the belief that more emphasis on the humanities and social sciences in their premedical education would have been helpful in preparing them for the study and practice of medicine (Table 3.6[1]). Of the specific undergraduate courses in which these medical students noted deficiency, by far the greatest proportion mentioned were in the area of the humanities and social sciences (Table 3.7). The evidence of these questionnaire replies was not accepted entirely without reservation. Some discussants inclined to the belief that much of this attitude about the value of the humanities was lip service conditioned by popular thinking, and was not neces-

[1]This is a remarkably consistent figure. Of 343 students queried in preparation for the second institute, 266 desired more courses in the humanities; 193 wanted more courses in social sciences. *J. Med. Educ.* 30:130–ED.

TABLE 3.6

STUDENT OPINION ON HUMANITIES AND SOCIAL SCIENCES

(Student group)

(*Question*: Do you feel that more emphasis on the humanities and the social sciences in your premedical education would have been helpful in preparing for the study and practice of medicine?)

Response	% of 1st yr. students (N = 700)	% of 4th yr. students (N = 560)
Yes	65	71
No	35	26
No response	†	3

†Less than 1 per cent response.

TABLE 3.7

STUDENT OPINION ON DEFICIENCIES IN UNDERGRADUATE EDUCATION

(Student group; Multiple response)

Area of premedical study	% of students reporting deficiency	
	1st year (N = 700)	4th year (N = 560)
Biological sciences	25	13
Business	2	3
Foreign languages	7	7
Humanities	61	62
Mathematics	15	6
Physical sciences	17	9
Social sciences	65	77
Other	11	10
No response	11	18

sarily the result of real thought and conviction. Others suggested that the medical schools' selection policies might bear some responsibility for the preponderance of students deficient in liberal arts background.

In the words of one member: "The American student is not interested in a liberal education, whether liberal in science or humanities; he wants a very practical course of study—even if he afterward feels its limitations."

That a college experience of less than four years may be a factor in limiting a liberal education is suggested by the questionnaire (Table 3.8). In tax-supported medical schools, 35 per cent of the students polled entered medical school in three years or less, while in privately supported medical schools 20 per cent had three years or less of college education.

The concern of the participants of the Institute for a liberal premedical education consequently appears fully justified by the results of the questionnaire. If a liberal arts background is equally esteemed by those responsible for the admission policies of medical schools, it would appear that the requirements and implied attitudes of medical schools should be carefully reviewed and premedical students and their advisers made aware of the importance of obtaining a *liberal education*.

TABLE 3.8

NUMBER OF YEARS OF PREMEDICAL EDUCATION

(Student group)

Entered medical school after premedical work of:	% of students attending			
	Tax supported medical schools		Privately supported medical schools	
	1st yr.	4th yr.	1st yr.	4th yr.
Three years or less*	40	30	19	21
Four years	54	62	74	74
More than four years*	6	6	6	5
No response	0	2	1	0
Responding *N*	(354)	(287)	(344)	(273)

*The questionnaire items from which these data are taken provided for responses only to "after three years" and "after four years." A total of 20 students wrote into their questionnaires that they had had less than three years premedical training. A total of 71 students wrote in that they had had over four years. While the latter group is listed separately, the number may be an underestimate since some students who had over four years may simply have checked the "after four years" response that was provided.

Preprofessional preparation for anatomy

The consensus of the Institute was that able students comprehend anatomical subjects satisfactorily in the absence of preliminary advanced courses in the biological sciences and are not at a disadvantage in attaining success in the anatomical disciplines when their major educational background is in the humanities. The student with extensive experience in biological science often is able to get off to a running start in medical school because of familiarity with concepts and vocabulary. In the long pull, however, he will perform in a way consistent with his capacities. One member pointed out that at his university many of the better premedical students choose other fields than advanced biology, while some of the poorer students specialize in biological science because of fear of difficulty in medical school. Some weak students possibly are assisted at the beginning of medical school by a greater background in biology; but innate drives and abilities and other factors not directly related to subject matter determine ultimate competence. It was felt, therefore, that a broad background in all fields of human endeavor and a wide understanding of man in his historical context are among the best preparations for anatomy as they are for any other facet of the medical curriculum. It is generally necessary to have basic training in biology, physics and chemistry, for these are the basic sciences of medicine; but it is not necessary to specialize before the student reaches medical school. However, as several groups emphasized, students should feel free to follow a detailed science course of study if they so choose and should be aware that such an experience also has cultural value. The interdepartmental major was the most highly rated undergraduate program of the premedical student: biology was second but more frequently mentioned (Table 3.9).

TABLE 3.9
MAJORS OF PREMEDICAL STUDENTS
(Undergraduate deans group)

Premedical major fields chosen by students	Undergraduate deans ratings		
	Mean ratings* of frequency	Responding N	No response (% of total N = 145)
Biology	3.69	(126)	13
Other natural sciences	1.98	(80)	39
Physical sciences	2.63	(119)	18
Social sciences	1.28	(96)	34
Humanities	.96	(100)	31
Interdepartmental†	4.00	(19)	87

*Ratings range from 0 to 4, with 4 indicating greatest frequency, 0 least frequency.
†Not asked; written in by 19 responding deans.

The minimal amount of biology generally desirable in preparation for anatomy was discussed by several groups. It was agreed by one group that one year of biology is sufficient if the course is comprehensive and if animal biology is stressed. On the other hand, there were those who thought that general courses in biology are not always the best type for premedical training. All too frequently laboratory work is not a part of such courses and they may be discursive and lacking in depth. It was generally agreed that biology courses in college should not attempt to anticipate the content of medical antomy.

Embryology

Considerable discussion focused on the value of embryology, comparative anatomy, histology and genetics in preprofessional preparation for anatomy. Embryology should not be an admission requirement, but principles of embryology could be a desirable facet of a liberal education. Embryology in college should not place its emphasis on human development, since the course should aim to convey basic principles, for which comparative material has greater value than solely human material. With a background of this kind, embryology in medical school, when properly integrated with anatomy as well as pediatrics and surgery, can increase appreciation of normal growth and structure and provide understanding of the source of many variations and anomalies and their treatment.

Comparative anatomy

Like embryology, comparative anatomy should not be an admission requirement; indeed, there were those who thought that experience in comparative anatomy does not notably improve a student's comprehension of human anatomy.

Histology

All who considered the question deplored inclusion of histology as an admission requirement and some were emphatic in the opinion that no time should be devoted to histology as an undergraduate subject. Histology, it was believed, should properly be taught students in a medical atmosphere. Students taking histology in college may often have increased difficulty in medical school because of over-reliance on their supposed knowledge from courses which are often primarily concerned with technique. College courses that are in effect abridged forms of those given in medical school are not only inadequate but may diminish the student's interest in his medical school course.

In evaluating biology courses, each participant in one section was asked to designate which he thought were the two most important courses in preparation for anatomy, among embryology, comparative anatomy, genetics, histology and general or cellular physiology. The results follow: embryology—11, genetics—7, comparative anatomy—6, histology—0, and general or cellular physiology—0. Evaluation of these courses for medicine as a whole gave these results: embryology—9, genetics—9, general or cellular physiology—4, comparative anatomy—2, histology—0.

Anthropology

The role of anthropology in preparation for medicine and in the medical school itself was discussed by several groups. Some background material in anthropology was considered an asset for the student in medicine, whether acquired before or after entering medical school. It should not be made a premedical requirement. Many felt that cultural anthropology, if given in medical school, is not properly the province of the anatomist but would more easily fit into the teaching program of the psychiatrist, pediatrician, or possibly instructor in preventive medicine.

Questionnaire disclosures

The questionnaire material (Table 3.2) prepared from the answers of the first- and fourth-year medical students show some discrepancies from the views expressed by the participants in the Institute. The participants expressed the view that college courses in embryology, comparative anatomy and genetics are of value in preparation for medical school anatomy. The answers to the questionnaire given by both groups of students agree in the case of embryology and comparative anatomy. Genetics, however, was rated low. Participants regarded college courses in histology as of no value for medical histology. Students gave it about the same rating as comparative anatomy and embryology, considerably ahead of genetics and anthropology. The participants ranked embryology and genetics high on the basis of providing a background for medicine as a whole and regarded anthropology as an asset, but saw little value in comparative anatomy and none in college histology. In contrast, student opinion rated comparative anatomy and histology high. The opinion of the participants in the Institute was that college courses should not place their emphasis on man but that comparative material is better suited for gaining an understanding of basic principles. The majority of the students (66 per cent of first-year students, 57 per cent of the fourth-year) questioned, however, felt that more emphasis on man in their undergraduate education would have been desirable and useful.

This difference of opinion between the participants and the students is particularly interesting. Many anatomists regret that time does not permit greater emphasis on comparative morphology in the medical school courses. Basic principles could be thereby more easily presented. Somewhere there is a point of contradiction. Students request a broad cultural education and then ask for greater emphasis on man in their courses in biology. An enlightened appreciation of the flora and fauna about us should be no more constricting intellectually or no less a cultural attainment, than an appreciation of other subjects. The students themselves apparently are not aware of this contradiction of thought or statement. Perhaps biology courses are not often presented to medical students in such a way that their general educational scope is comprehended adequately. Liberalism in education may imply a breadth that must be accompanied by superficiality and hence opposed to depth of knowledge in any one area. "Without desiring to abandon a scintilla of what is of genuine worth in the disciplinary and liberal-culture ideal of college training, it is fair to urge that we study afresh the problems of motivation of our students. A liberal education, at which the average student balks and perhaps only a portion of which is all he will actually assimilate, may be defeating its own purposes by an insistence upon its form when the substance has already fled."[2] Apparently the motivation for the student in courses in biology is commonly the understanding of man, whereas the participants at the Institute reflectively assume that the motivation in biology should be for a greater comprehension of life and its evolution and the principles of heredity.

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[2]Piersen, C. W.: *A History of Yale College*, Yale University Press, 1955.

English

Everyone agreed that fundamental training in English, both in writing and speaking, is essential and is at present generally inadequate. It was believed that the roots of this deficiency extend to the base of our educational system; yet it was felt that the colleges might increase their efforts to correct the situation. Students should early be made to understand the importance of fluent writing and speaking as an adjunct to their intended profession. Over-reliance on objective-type examinations and visual aids, it was suggested, contributes to the lack of facility in communication. Departments of anatomy should attempt, as far as possible, to correct these deficiencies in students. Periodic essay examinations and the preparation of papers on anatomical topics should be encouraged.

Foreign languages

It was generally agreed that facility in two contemporary foreign languages, while desirable, could scarcely be expected. Some felt that a reading knowledge of one foreign language should be demonstrated before admission or before entering the second year and that retention of this knowledge might be assured by required reading in the language while the student is in medical school. There was considerable support for the view that even one foreign language should not be required, as it is not essential to the successful practice of medicine.

Some thought that Latin and Greek have sufficient cultural and practical value in medicine to justify their restoration to the curricula of secondary schools and colleges.

The conviction of the participants with regard to the desirability of further training in English gained little support from the questionnaire replies supplied by first- and fourth-year medical students. Less than 20 per cent rated this as an important area of study in preparation for the study and practice of medicine. Fewer than half this number were in accord with the consensus of the Institute as to the importance of the study of contemporary foreign languages.

Emotional stress

Premedical students, it was believed, are frequently subject to more anxiety than other students, due to the highly competitive situation and their concern over acceptance by a medical school. Some thought that this anxiety stemmed to some extent from the fact that premedical students are directed along a limited path, without alternatives, if not admitted to medical school. Anxiety of this sort might be alleviated by thoughtful advice. The segregation of premedical students from their college fellows tends to contribute to these difficulties, and was deplored.

Acceptance of outstanding students by medical schools after the first two years of a four-year college course was recommended by some as a means of reducing tension during the latter part of college. The adoption of such a plan would require modification of the recent agreement among deans of medical schools opposing early acceptance. It would also conflict with

TABLE 3.10

UNDERGRADUATE DEANS' OPINIONS OF STUDENT CHARACTERISTICS
(Undergraduate deans group)

Size of premedical group	Deans commenting on unique characteristics of group			
	% noticing uniqueness	% not noticing uniqueness	Total N	% no response
Less than 100 students	56	38	32	6
100 - 200 students	39	59	49	2
Over 200 students	54	43	37	3
Unknown size	63	30	27	7

the present Medical College Admissions Test. This was posed as a real problem; yet the opinion was expressed that present arrangements for giving the Medical College Admissions Test are not inviolable. Such early selection would require much closer cooperation than now exists between the admission committees of medical schools and the advisers of premedical students in the colleges. Some believed that this close cooperation has already been achieved between certain medical schools and colleges. It was generally felt that the importance of close cooperation and understanding between these schools could not be overemphasized, and that it would work to the mutual benefit of both parties concerned, whether or not premedical students were assured of admission to medical schools before completion of college.

There was considerable speculation as to how far students should be shielded from anxiety. Whatever the tensions aroused by concern regarding admission to medical school, they would be no less strenuous than those likely to be engendered by the competitive atmosphere of the medical school, or, more important, by decisions required of a physician regarding the future welfare of patients. In the words of one discussant: "The response of the individual to and in his environment constitutes one means of evaluating his capacity to assume responsibility. This does not mean the environment should be unduly stressful; but neither does it mean that it should be unduly protective."

Somewhat more than half of the undergraduate deans who answered the questionnaire indicated that they had noticed unique characteristics among premedical students as a group. The emphasis on anxiety expressed at the Institute is not equally apparent in the responses of undergraduate deans (Table 3.10). Those characteristics which may be related to anxiety (more concern for grades, a sense of competition and greater nervousness) are less frequently mentioned than other desirable characteristics such as higher motivation and greater ability.

IV

Instruction and Learning in Anatomy

Learning and teaching, if either one is to be successful, cannot be disassociated.

COURSES IN ANATOMY afford not only the first but the most extensive experiences of students in medical schools. As a result, the anatomist frequently feels a great responsibility to make his courses serve not only as an introduction to, but the apogee of, anatomical education. The massiveness of the subject matter obscures the boundary between the two objectives of introduction and comprehensiveness. The student may acquire the impression that he is being taught only anatomy rather than human biology or medicine.

Less emphasis is being placed today on experimental or descriptive morphology in premedical education (see Chapter III). Because the student enters medical school with less experience in morphology at the basic or comparative level, the anatomist frequently finds it necessary to devote more time to teaching the elementary techniques and vocabulary of morphology.

Anatomical instruction and learning are time-consuming; the hours required exceed those of any other department in our medical schools. The subject matter of anatomy is largely objective and adapted to laboratory instruction. Laboratory experiences are therefore stressed in all aspects of anatomy (Table 4.1), and especially in gross anatomy and microscopic anatomy (see Table A.1). The anatomists at the Institute almost uniformly expressed satisfaction with the current policy of maximal opportunity for

TABLE 4.1

TEACHING EMPHASIS IN MEDICAL SCHOOL ANATOMY COURSES
(Participants group)

Teaching aspect	Rating,* mean index	Change preferred		Total N = 87	
		No. preferring decrease	No. preferring increase	Responding N	No response (% of total N)
Laboratory work and study	2.8	0	1	(86)	1
Accuracy and thoroughness of observation	2.7	0	2	(83)	5
Understanding biologic principles	2.3	0	2	(85)	2
Detailed knowledge of anatomy	2.2	1	2	(86)	1
Applications to clinical problems	2.1	0	4	(86)	1
Demonstration of special slides or preparations	2.1	0	1	(86)	1
Use of audio-visual aids	2.1	0	3	(83)	5
Use of prepared microscope slides	2.0	1	0	(85)	2
Anatomy in relation to overall human biology	1.8	0	1	(84)	3
Examinations of living body	1.7	0	14	(85)	2
Dissection technique	1.6	0	3	(82)	6
Review discussions and conferences	1.6	0	11	(84)	3
Study and examination of fresh tissues	1.3	0	4	(83)	5
The problem approach	1.0	0	13	(76)	13
Preparation of microscope slides	0.5	0	4	(84)	3
Other	2.2	0	0	(21)	76

*Ratings range from 0 to 3 with 0 indicating no emphasis and 3 indicating great or primary emphasis. In order to compare the emphasis given the various teaching aspects, a numerical index has been assigned each of four rating response categories.

laboratory work. Its importance extends beyond the inculcation of subject matter, in that it disciplines the student in accurate and thorough personal observation. In anatomy many students for the first time begin to appreciate the necessity of seeing and observing with their own eyes, not merely looking, and to acquire a skepticism of what is seen through the eyes of others. They begin to comprehend the individuality of man, his physical differences and similarities.

Concepts of teaching anatomy

Principles vs. detail. Most anatomists thought that courses of anatomy should emphasize basic concepts of human morphology, and at the same time instill a comparatively detailed knowledge of anatomy. To many, there was some conflict between these two points of emphasis. Some confusion was apparent in attempting to define the basic principles of human morphology. When consideration shifted to "concepts of human morphology," more productive discussion ensued. Concepts can be acquired through study of a single species. The details of human structure, variation, relationships and growth changes contribute to concepts, but when restricted to a small sample of life they are not sources of biological principles. Emphasis on basic concepts is therefore not in conflict with emphasis on detail. The two are inseparable, in that concepts can be acquired only after some knowledge of detail.

How much detailed knowledge is necessary for a formulation of morphological concepts was discussed at length and never fully defined. One participant, not an anatomist, suggested that a two-week course of demonstrations of human anatomy with good teaching films should be adequate to formulate adequate concepts of human morphology. Dissection was probably not necessary. This opinion was not shared by anatomists.

That much detail is forgotten was not denied. Human morphology was not thought to be unique in this respect, however. Anatomists may be or may have been remiss in combining detail and basic concepts. The anatomists at the Institute were willing to accept responsibility for some failure to devise teaching methods that emphasized significant details as examples of basic concepts rather than as isolated items of information.

The importance of the acquisition of concepts in the learning process was explored in one discussion group. In the words of one anatomist: "Most medical students seem to think that gross anatomy is primarily the job of absorbing a great volume of specific information, whose only general value lies in perfecting the technique of observation. While gross anatomy does provide valuable training in making independent observations, it provides little experience in arranging data and relating it, or in deriving syntheses or general principles as a logical and terminal conclusion of the analytic process. While anatomical dissection has been proceeding since the date 1543, we don't appear to have come up with an adequate way of teaching anatomy, such as the chemists have in deriving specific detail from general principles presented in the tables of the elements. Anatomy teachers might therefore be urged to devote more effort to the synthesis of general principles to be drawn from anatomy, rather than directing their teaching primarily or entirely to the analytic process. Additionally, the association of detailed in-

formation and its relation to clinical problems should be encouraged."[1]

Most of the anatomical textbooks, which are sometimes relied upon as sole source of reference, neglect the opportunity to include sections in which syntheses and general principles, derived from the large volume of detailed information, are emphasized. Many anatomists took issue with the point of view of one who purposely refrained from helping students integrate material, lest this weaken their initiative and lessen the likelihood of their arriving at original syntheses on their own.

Some need for a definition of basic principles in anatomy was manifest in many of the discussion sessions. In the words of one teacher: "We seem to be paying lip service to concepts that we cannot clearly define or put into words. Therefore we find ourselves forced to fall back onto the details to fill out our courses. A monograph to crystallize our thinking regarding basic principles would be helpful. We should emphasize morphology and variation of the entire body in our teaching, rather than the minutiae of the structures of the body."

Applications of anatomy

Interestingly, more anatomists placed more emphasis on the applications of anatomy to clinical problems than on observations upon the living body (Table 4.1).[2] A tendency to emphasize the abnormal and the diseased, rather than the normal and healthy was indicated by the replies to the questionnaires. The inclination of teachers to stress the applications of anatomy undoubtedly contributed to student desire for such experiences. But, just as medicine is becoming increasingly concerned with the maintenance of health and well-being, so may anatomy become increasingly concerned with normal morphology and development. More anatomists were in favor of increasing the examination of the living body as a teaching aid than any other one aspect (Table 4.1), indicating that an insufficient amount of emphasis is now given it. X-ray anatomy and fluoroscopy, which are connected with living anatomy, are examples of areas where this is being stressed.

Some teachers felt that applied knowledge might reinforce basic morphological concepts. Since almost all aspects of anatomy are of some practical value, it was generally considered a reasonable didactic aid to bring some of the applications to the attention of the student, but with chief emphasis on the anatomy involved rather than on the specific application. Some anatomists pointed out that clinical application of anatomy also provides additional motivation. Some schools scheduled clinical anatomical conferences during the first year to increase such experience. It was thought that, unless the students have an adequate grounding in pathological or applied aspects, the demonstrations might be of limited usefulness. Often much time must be spent in developing background for understanding.

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[1] MAINLAND, D.: "Anatomy Renovated: An Example of Change in Medical Education," *Nova Scotia Med. Bull.* 24:72-81, 1945, some discussion on this point.

[2] No attempt was made to separate the answers of those who were basically interested in teaching different courses in anatomy. Some of the data might have been influenced by the number of persons teaching gross anatomy or histology; in the latter courses "practical applications" may have been emphasized more than "living anatomy." Ed.

The utilization of special demonstrations, histological slides and audio-visual aids was stressed by many anatomists. Radiological anatomy is encouraged in some schools; another has roentgenograms of each bone of the osteological loan sets available for study. Moving pictures are of unique value in depicting embryologic development. More extensive use of three-dimensional illustrations and stereoscopic pictures which have proven successful in gross anatomy and embryology can be advantageously applied to histology as well.

Block vs. long-course system

Opinion was equally divided as to whether courses of anatomy should be given over a short "block" period of time, or whether they should be given throughout one or two years and concurrently with other courses. The participants were enthusiastic in the support of the plans they sponsored and for diverse reasons (Table 4.2). In general, those favoring the more prolonged courses thought them better for the student. The block system provided greater opportunities for research or ancillary activities of the teachers. This was not consistently true, however. Some reasons given by different advocates of the two systems seemed to be directly contradictory. Apparently each system had proved successful for those who favored it. Objective criteria for their comparative evaluation had not been established. It was evident that personal prejudices and preferences played a large part in determining support for each system (see Table A.14).

In one school new classes were entered several times a year and all courses were blocked. The point was made that most schools teach clinical courses in blocks. It was noted that, although this was true, the clinical subjects were in themselves more heterogeneous; they were composites of

TABLE 4.2

VALUE TO STAFF AND STUDENTS OF TWO TEACHING METHODS
(Participants group; Multiple response)

Response	Frequency
1. Favoring longer, concurrently taught anatomy courses (preferred by 53% of 85 respondents)*	
Value to students	
More time for absorption and revision and integration	25
Opportunity to integrate with other courses	20
A more sound educational practice	6
Better opportunity to evaluate student performance	5
Less monotonous sameness	4
Miscellaneous	9
Value to staff	
More regular time for research and other activities	7
No special advantage to staff	7
Is less fatiguing	5
Opportunity to integrate with other courses	3
2. Favoring shorter, block-time teaching of anatomy (preferred by 45% of 85 respondents)*	
Value to students	
To advantage of students to concentrate in one area	13
Better integration of anatomy subjects	9
Fewer competitive course examinations and courses	7
Better and more rapid adjustment to a new environment	3
Students have done better	3
Miscellaneous	12
Value to staff	
Opportunity for more concentrated research time	25
Miscellaneous	5

*Total N of participants group = 87; no response = 2.

multiple preclinical disciplines as well as presentations of the general and specific concepts of the subject itself. In support of block time, it was suggested that anatomy is not necessarily homogeneous but is a composite of three or four separate subjects that can be integrated among themselves without concern for biochemistry, physiology or microbiology.

Current trends seem to point toward more extensive integration, or toward courses given over a long period of time and concurrently with other subjects. Several participants, although connected with schools where the block system is used, did not favor the system. Psychologists appear to concur that prolonged concentrated contacts with a single subject reduces learning efficiency, and that the more contrasting the sequences of subjects offered during any one day, the more effective the educational experiences. Training courses may be concentrated, but basic courses seem best taught when mixed with contrasting experiences. Nevertheless, it is obvious that both systems can work; the enthusiasm of the teachers and the eagerness of the students in favor of each arrangement make it difficult to determine the relative merits of the two systems.

Examinations

According to replies to the questionnaire, over 90 per cent of the schools require final course examinations and periodic examinations during the course, and more than half of the schools grade the examinations numerically. National Board Examinations were required by 17 per cent of the schools. Examinations were usually regarded both as teaching devices and as a means of appraising a student's knowledge. Objective examinations were not considered to be effective as teaching adjuncts in comparison with other types of examinations (Table 4.3). "Problem type" examinations were thought a poor means of evaluating a student's knowledge of the subject.

TABLE 4.3

OPINIONS ON THE VALUE OF EXAMINATIONS
(Participants group)

Type of examination	Value as teaching device			Value as check on learning		
	Mean rating of value as teaching device*	Responding N	No response (% of total N =87)	Mean rating of value as a check*	Responding N	No response (% of total N =87)
Oral	2.3	(77)	12	2.0	(80)	8
Setting of problems	2.2	(75)	14	1.6	(74)	15
Written	2.2	(69)	21	2.4	(75)	14
Practical	2.2	(79)	9	2.5	(85)	2
Essay	2.1	(78)	10	1.9	(81)	7
Objective	1.1	(71)	18	2.0	(80)	8

*Ratings range from 0 to 3 with 0 indicating no value, 3 indicating great value.

Examinations were not particularly popular among the participants; they were looked upon as unavoidable requirements. In spite of this, the majority did not feel that they conflicted noticeably with basic teaching objectives or with the faculty-student or inter-student relationships (Table 4.4). Apparently no known means of avoiding examinations seems to exist and a rather passive resignation to their necessity dampened interest in discussing which types were preferable. Examinations directed to "driving" the students came in for sharp criticism. In fact, one reason given in favor

TABLE 4.4

OPINIONS ON THE EFFECT OF EXAMINATIONS
(Participants group)

Effect of examinations	% response (N = 87)		
	Agree	Disagree	No response
Conflict with basic teaching objectives	16	75	9
Conflict with quality of student-teacher relationships	17	83	0
Conflict with quality of inter-student relationships	15	80	5

of the block system was greater freedom from multiple stressful examinations given concurrently by two or more departments. Departments tended to compete with one another for the students' time, with examinations providing the compulsion.

Comparatively little enthusiasm was demonstrated for comprehensive or interdisciplinary examinations, the general impression being that course examinations were adequate. The relative reservations regarding extensive integration of basic science courses seemed to parallel the cautious consideration of comprehensive examinations.

Although today more students admitted by medical schools actually complete their studies than ever before, reliance continues to be placed on examinations as a means of spotting those with inferior knowledge or ability. The judgment of admitting committees and officers cannot be infallible. Furthermore, examinations given early in courses at least seem to provide some needed motivation; the students have entered medical school from a competitive, grade-conscious environment.

If examinations are traumatic experiences, it seems unfortunate that they should be imposed on so many students in order to ascertain a few errors of selection, unless they serve some additional useful purpose. But many anatomists held that examinations are neither really disconcerting nor particularly helpful to the better students. Some wondered if the tendency of examinations to make all students strive for high grades in all courses might not prevent the development of particular interests in certain subjects.

The efficacy of course examinations in determining a student's suitability to continue in medicine was cautiously mentioned. Course examinations were not required in only two schools. Were the courses in anatomy better in these schools—or rather in the one school, because one school did not give a separate course in anatomy? Was the teaching more effective? The questions might have answers but they were not answered at the Institute. At least course examinations were not absolutely essential if the experiences of one school are considered.

National Board Examinations by themselves were considered adequate in one school that did not require course examinations. The students were, nevertheless, evaluated periodically by the teachers through contact with the students in the laboratory or in conferences. This method admittedly was not adapted to large classes or smaller faculties. In this school exami-

nations were given but were not graded—except by the student himself. An acquisition of the capacity to judge his own knowledge or deficiencies was considered to be a worthy learning experience. Obviously the privilege of no required course examination assumes the coexistent responsibility of self-evaluation by the student and requires probably more teacher-student contact than the more formalized systems.

Many anatomists obviously did not think the time spent taking examinations or reading and grading them was profitable either to student or teacher. Most teachers would rather guide than judge, would rather be more concerned with the good student than with the poor student, yet they have not devised ways of avoiding examinations.

Textbooks

The inadequacy in available textbooks was underscored by many at the Institute. Not only are additional books thought needed, but those in use should undergo considerable revision. According to the questionnaire, more than three-fourths of the schools recommend preferred texts to their students, nevertheless; others leave the selection completely up to the students (Table 4.5). Dissatisfaction with texts was apparent both in discussion at the Institute and in answers to the questionnaires. Approximately half of the anatomists were of the opinion that they did not fit current teaching needs (Table 4.6; see also Table A.15).

Histology textbooks were criticized less than those on neuroanatomy and gross anatomy. Gross anatomy textbooks in particular were in disfavor. Although courses of gross anatomy are now only half as long as formerly, the same comprehensive textbooks are used. The comprehensive texts are usually systemic and do not present regional anatomy as it is now usually taught, or do so only incidentally. Too frequently entire sections in the larger texts on the central nervous system are not used in neuroanatomy; special books must be purchased for this subject. Inadequate expositions on miscroscopic anatomy or embryology in some texts on human anatomy are not used by students because of preference for treatment given in other texts.

The comment was made that the more massive and comprehensive textbooks, in spite of their cost, their unused pages and their systemic approach,

TABLE 4.5

TEXTBOOK POLICIES
(Participants group)

Policy	% response (N = 87)		
	Yes	No	No response
Recommend preferred texts	79	9	12
Recommend reading original material in addition to texts	62	29	9
Give students a choice of recommended texts	54	20	26
Recommend selected text material from several textbooks	49	43	8
Require specific textbooks	34	54	12
Give students complete freedom of choice of textbooks	23	53	24

TABLE 4.6

TEXTBOOKS AND THEIR DEFICIENCIES
(Participants group)

Do textbooks fit anatomy teaching needs?	% response (total N = 87)
Yes	24
Yes with qualification	16
No	37
No with qualification	9
No response	14

rarely grace the shelves of second-hand bookstores. They are the books the doctors keep. Apparently, with all their cumbersome details, they have value.

In spite of the extent of criticism, when a group of discussants attempted to suggest what should go into an ideal book, and how it should be emphasized, there was little agreement. Each person had his own ideas—a short but detailed, a practical but basic, a well-illustrated book but not an atlas, a regional text, with the areas taken up in this or that order—were proposed. Others thought the best text was one that would serve as a reference book to supplement personal observation and study; or it might possibly be a laboratory guide. The cursory discussion clearly outlined the difficulty in preparing a textbook that would be satisfactory to all. It was pointed out that few courses are designed to fit any text nor should they be so designed. But one of several different texts in each subject, if appropriately used, should be adequate. A good course, the discussants conceded, is probably neither made nor impaired by the absence of an ideal text, although existing books frequently determine the type of material taught and tend to maintain the status quo in courses. Few textbooks have been planned that might instigate changes in courses of anatomy in recent years, such as Mainland's book on human anatomy or Cowdry's book on histology.

More than half of the departments of anatomy in medical schools recommend manuals or syllabuses for laboratory instruction and most of these are prepared by teachers for use in their own courses (Table 4.7). The syllabuses differ greatly in length and detail in different subjects in different schools, ranging from short assignment or check sheets to what are almost substitute textbooks. The manuals or syllabuses usually determine the schedule of the course, and in most schools schedules are rigidly maintained. At least one school, however, permits students to set their own pace and present themselves for examination when they considered themselves prepared.

Appraisal of teaching effectiveness

Methods of appraising teaching effectiveness came in for attention. Various devices are utilized in a fairly informal way to assess this factor.

Fifty-three per cent of the schools have faculty committees that make reports annually on curriculum and teaching, and 30 per cent have such committees functioning occasionally. Sixteen per cent of the schools have no committees to evaluate curriculum and teaching. It was admitted that reassessment of the curriculum was desirable. Anatomists have been somewhat on the defensive in recent years lest this result in curtailment of time for anatomy. In 41 per cent of the schools the students evaluate teaching effectiveness and curriculum each year. Occasional student critiques are requested in one-fourth of the schools. It was pointed out that student reports frequently cover little more than effectiveness of presentation but are sometimes considered to be very constructive. More often they are either routine or contradictory from year to year.

Departmental discussion on instructional policies occurred in many departments and had produced constructive ideas that were incorporated into the teaching program. Suggested modifications in some instances were,

TABLE 4.7

USE OF MANUALS AND SYLLABUSES FOR LABORATORY INSTRUCTION IN ANATOMY
(Participants group)

Participants who:	Histology (N = 87)			Gross anatomy (N = 87)			Neuroanatomy (N = 87)			Embryology (N = 84)*		
	% Yes	% No	% No response	% Yes	% No	% No response	% Yes	% No	% No response	% Yes	% No	% No response
Recommend a manual or syllabus	52	29	19	72	13	15	62	24	14	39	23	38
Prepare a syllabus for local use	54	32	14	52	30	18	66	24	10	35	27	38
Recommend use of published manual or syllabus	12	58	30	43	41	16	20	54	26	16	39	45
Pass out prepared laboratory directions from time to time during the course	40	30	30	37	35	28	49	23	28	31	21	48

*Responses of three participants who indicated Histology and Embryology are taught as combined course are included in the count for Histology, not included in the count for Embryology.

TABLE 4.8

ADEQUACY OF CADAVER SUPPLY
(Participants group)

Cadaver supply is:	% commenting on supply for 4 groups (Total N = 87)			
	Preclinical courses	3rd & 4th year courses	Postgraduate courses	Ph.D. aspirants
No response	1	25	15	20
Inadequate	13	36	31	18
Adequate	86	39	54	62
But*: Only because adjustments made	27	21	17	21
Number is o.k. but quality not	13	9	11	7
No qualifications	60	70	72	72

*Percentages based on number responding that the cadaver supply is adequate.

however, not appropriated because of lack of funds, facilities or leadership.

Interdepartmental discussions on teaching were much less frequent in most schools. Only 18 per cent of the faculty reported frequent consultations between members of the anatomy staff and other departments on teaching matters.

Cadavers

A perennial problem of medical schools is maintaining an adequate supply of cadavers for anatomical study. Replies to the questionnaire as well as discussion at the Institute underscored the need for a continuous program aimed at public enlightenment as well as utilization of all possible sources of supply by the medical schools themselves.

It appeared that, in those states where good anatomical laws exist, and where faculties have made special efforts to cultivate a variety of potential sources, the schools are well provided with cadavers. Others suffer constant harrassments from inadequate teaching material. Thirteen per cent of the schools questioned reported shortages in cadavers for basic instruction in anatomy. A third of the schools did not have enough for upperclass or postgraduate courses (Table 4.8).

Many schools have met this situation by special arrangements to compensate for shortness in supply (Table 4.9). The number of students assigned to a single body has in some cases been increased to eight (Table 4.10).

TABLE 4.9

ADJUSTMENTS FOR INADEQUATE CADAVER SUPPLY

(Participants group; Multiple response)

Arrangement	Per cent of 37 respondents reporting arrangement*
More students assigned to each cadaver	60
Postgraduate courses are curtailed	57
Upperclass courses are curtailed	54
Greater use of prepared dissections as demonstrations	38
Use of newborn or premature cadavers	11
Use amputation material	8
Other†	24

*Of 57 participants reporting some inadequacy of supply, 20 gave no indication of adjustments being made for the inadequacy.

†Other: Use of autopsy bodies, 4; one each of the following: curtailment of dental students, new laws, reserve stock, willed bodies.

TABLE 4.10

NUMBER OF STUDENTS ASSIGNED TO ONE CADAVER

(Participants group)

Number of students assigned	% of 34 reporting inadequate supply of cadavers for one or more groups of students	% of 51 reporting no inadequacy*
Two	3	10
Three	0	4
Four	67	78
Five	9	2
Six	12	4
Seven	0	0
Eight	9	2

*Of 53 reporting no inadequacy, 2 failed to indicate number of students assigned.

Many suggestions were discussed as to methods of increasing the number of cadavers available to medical schools. They included appeals to welfare agencies, personal contacts with hospital superintendents, and cultivating the cooperation of physicians and medical students, to whom interested patients would turn for information (Table 4.11; see also Table A.16).[3]

[3]A recent detailed report on the supply of anatomical material has been published in a *Bulletin from Medical Research*, Vol. 10: No. 2, November-December 1955, "The Supply of Cadavers, Is There a Problem?" Some of the data are different than those in the tables enclosed in this report but indicate that the problem is even greater. The plans used to procure cadavers in some schools are described in detail.—ED.

TABLE 4.11

SOURCES OF CADAVER SUPPLY
(Participants group; Multiple response)

Supply source	No. of responses of those who report cadaver supply is:*		
	Satisfactory	Adequate	Unsatisfactory
Contact with state or provincial institutions, penal or mental	4	16	—
Maintenance of good relations with morticians	2	15	2
Constant check with morgue custodian	—	1	—
Contacts with county, town or city medical officers or attorneys	1	7	1
Cooperating with religious groups	—	—	1
Encouraging contribution or willing of bodies	1	15	1
Adequate legal consultation provided by school	—	1	—
Presentation of problem to charitable and welfare organizations	—	3	1
Considering best interest of clinicians and pathologists	1	1	—
Obtaining or enforcing good anatomical laws	8	13	1
Payments to relatives	—	1	—
Maintaining cooperation with hospitals and health officers	—	4	—

**Satisfactory:* no problems at all or an excess of available cadavers.
Adequate: enough material at the present time, some apprehension about the future or adequate only because of constant vigilance.
Unsatisfactory: method tried but was failing to produce adequate results.

The most effective method, however, was thought to be the legislative approach to tighten permissive state anatomical laws and make them more compulsory. It was noted that in several states the number of cadavers made available through premortem requests of the deceased had increased considerably. Legislation in one state now legalizes the willing of bodies.

Social welfare legislation has hampered procurement of cadavers to some extent, and legislative steps should be taken to meet these difficulties in each state. Some anatomists thought that more might be done by way of capitalizing on increased public interest in health and disease. Bone banks, eye banks and blood banks are in popular favor. It was thought that if the public were better apprised of the need, much more cooperation would be forthcoming.

In one community, this was accomplished through informing civic and welfare groups of the need when occasions arose and offering to remove and transport bodies at no cost to the estate. In this case there was only permissive state legislation, i.e., no compulsion to follow the expressed wishes of the deceased.

A representative of another medical school described the success of what was very definitely embarked upon as a program in public relations. In cooperation with the publicity department of the university and the local newspaper, a series of articles was prepared frankly laying the problem before the public and highlighting the importance of this kind of philanthropy in the public interest. Results had been successful beyond expectation.

The effectiveness of articles in the public press could not be underestimated. This aspect of medical education, one participant brought out, has remained in the half-light, suppressed by public consciousness not only because of a traditional human reluctance to explore such possibilities for oneself or one's loved ones, but because of failure of the scientists themselves to emphasize the true philanthropy inherent in the gesture of giving one's

body for science. Syphilis was only conquered when it was brought out of the shadows of secrecy and talked about publicly. Similar advances might be possible through a carefully planned and long-term program of public education on the need for anatomical material.

One doctor, a professor of surgery, raised the question as to whether anatomy could be taught effectively without cadavers. He said that half the time in dissection is spent in cutting, and suggested that more use might be made of textbooks, charts and photographic slides, etc. The anatomists present were against such an argument and overwhelmingly in favor of dissection as the most valuable aid in teaching gross anatomy in that it offers opportunity for observing the three-dimensional effect of organic structures.

Another participant made the challenging proposal that the inventive genius of scientists should be directed toward constructing a composition body which would be considerably more natural and useful than some of the plastic models used here and there today. He thought that, with the recent advances in composition material, the time had now come when a model of extreme verisimilitude to the human body could be devised which would be serviceable. No further discussion ensued as to the detailed way in which such an invention might be developed.

Teaching activities

Teachers of anatomy tend to specialize in one or two basic courses; almost one-half of the teachers polled in the questionnaire taught only one basic course (Table 4.12). Approximately half instructed in two courses during any one year. About 10 per cent taught all of the required basic work in anatomy during any one year. Most of these teachers were from schools at which the anatomy courses were completely or highly integrated. In some only one course, including all required aspects of human morphology, was given.

About 70 per cent of the anatomists taught the same course or courses year after year. The chairmen and instructors generally had the most varied teaching activities. Most anatomists preferred to teach the same basic course or courses repeatedly; few desired to teach all subjects (Table 4.12). The difficulties of establishing a really integrated teaching program in anatomy are evident from the above. Instructors will have to assume a greater latitude of teaching responsibility. Temporal integration is often confused with integration of subjects, or concepts or objectives.

Interdepartmental integration occurred in 42 per cent of 90 departments reporting. In 24 instances only one department was involved, such as surgery, or pediatrics, etc. Multiple departmental integration of the educational program occurred in 11 other schools. The greater number of the interdepartmental courses involved neuroanatomy and either neurology, neurophysiology or neurosurgery.

Electives

Some anatomists teach elective courses but the number was surprisingly small (143 of 487 indicated they taught elective courses, see Table A.8),

TABLE 4.12

ACTUAL AND PREFERRED ANATOMY TEACHING LOAD
(Faculty group)

Rank	Regularly teach in any one year (%)				Every few years (%)			Year after year (%)			No response (% of total N)
	In only one of the basic courses	In two of the basic courses	All required work in anatomy	No response (% of total N)	Teach different basic course		No response (% of total N)	Teach the same basic course(s)		No response (% of total N)	
					Yes	No		Yes	No		
Actual teaching load											
Chairman (N = 75)	46	40	13	1	23	69	8	73	20	7	
Professor (N = 76)	47	46	4	3	12	79	9	87	8	5	
Associate professor (N = 116)	44	46	9	1	20	77	3	83	15	2	
Assistant professor (N = 116)	32	53	14	1	31	63	6	70	21	9	
Associate, fellow, lecturer, instructor, assistant (N = 104)	38	46	14	2	34	54	12	57	27	16	
Total faculty (N = 487)	41	47	11	1	24	68	8	73	19	8	
Preferred teaching load*											
Chairman (Responding N = 66)	24	29	24		35			38			12
Professor (Responding N = 70)	43	31	6		23			56			8
Associate professor (Responding N = 102)	37	29	11		34			46			12
Assistant professor (Responding N = 109)	38	33	12		37			38			6
Associate, fellow, lecturer, instructor, assistant (Responding N = 99)	31	32	17		43			34			5
Total faculty (Responding N = 446)	35	31	14		36			42			8

*Note that this section of the table is multiple response. Note also that percentage of faculty response is based on responding N, not total N as above.

TABLE 4.13

PREFERENCES FOR CHANGE IN TIME ALLOTTED TO FACULTY ACTIVITIES

(Faculty group)

Activity	% of 484 faculty members who indicated time allotment			
	Want more time	Want less time	Want no change	No preference
Teaching required medical courses	9	36	41	14
Teaching elective courses	22	4	60	14
Seminars	17	6	63	14
Research	46	7	33	14
Committees and administrative	7	31	48	14
Other	4	17	65	14

and the total number of hours devoted to teaching elective courses was small. The teaching responsibility of the anatomists thus appears to be well restricted to basic or required courses and the experiences afforded the students within each school are uniform and standardized.

The implication of the limited availability of electives was examined without any conclusion being reached. Perhaps time is not available in the current crowded curricula for courses other than those required of all medical students. Perhaps teaching energies are so largely spent in the instruction in basic courses that little is left to establish elective courses wherein special aspects of a subject might be presented to a small group of students. Perhaps research interest must be guarded from the encroachment of additional teaching time. It was suggested that, on the other hand, *if the curricula are so full that students have no time for electives, something should be done about it.* Are we only giving lip-service to the philosophy of liberal education? *If teachers have neither time nor energy to imbue students with an interest in those areas which are intellectually stimulating and exciting to them, and hence in those frontier areas of scientific knowledge, they cannot fulfill their total responsibility.*

Elective courses are not used effectively in most schools. Of the 28 departments offering electives, almost a fourth were for students in the third and fourth years, and were predominately courses in applied anatomy. Others, multiple in number and diverse in subject in a number of departments, were usually related to special or research interests of one or more members of the staff. (Twenty schools offered from 1 to 10 electives that were available for students of the first or second years; in nine schools the number ranged from 2 to 5 electives.) They were probably elective to both teacher and student. About 20 per cent of the anatomists wanted more time for electives (Figure 2 and Table 4.13). Most elective courses are short, being scheduled for from 15 to 44 hours.

Sometimes elective courses are scheduled because it is impossible to include basic material in the required courses during the time available. Such courses, then, are really not elective in the true sense. Some, such as embryology, are given for those students who have not had such a course in college. The more ideal electives, it was agreed, are those that provide

Figure 2

Actual and Preferred Time Allotment of Full-Time Faculty Members

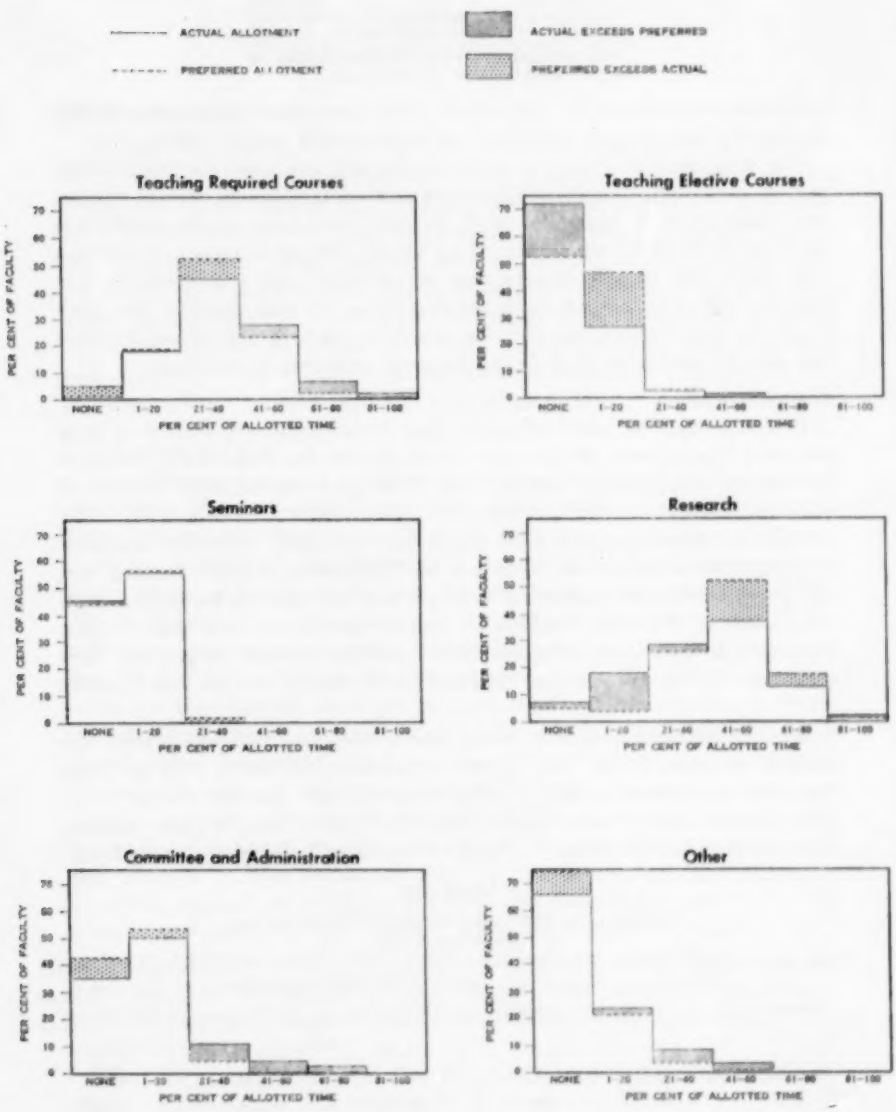

TABLE 4.14

REASONS FOR USING PART-TIME TEACHERS
(Chairmen group; Multiple response)

Reason cited	% of 71 depts. who use part-time teachers*
Limited budget	51
Impossibility of getting sufficient full-time staff	35
They supply clinical correlation	83
Insufficient interest on part of full-time men	3

*No response =1%. Out of 90 departments, 72 use part-time teachers and 18 do not.

additional experiences for the students who have special interests and that are for the greater part presented by teachers with special interests.

The large basic or required courses are usually under the direction of one person, even in a democratically run department, although several persons may participate in giving it. Such teaching situations are frequently less satisfying than those which one alone directs. Elective courses, being as a rule small, are usually courses that are planned and conducted by one teacher, and thus permit more self-expression. It was thought that they might be particularly desirable for younger teachers, for whom rotation was also deemed more useful than for more experienced teachers.

Part-time teachers

Part-time teachers, usually from clinical departments, are utilized in most anatomy departments (80 per cent) of the 90 schools. Most of the chairmen of anatomy departments thought that these part-time teachers introduced valuable clinical correlations into the basic courses (Table 4.14). The courses in gross anatomy most frequently attracted part-time teachers; histology rarely did so. In a number of departments, limited budgets and shortage of full-time anatomists were given as the reasons for having part-time teachers. Part-time teachers are usually temporary with short tenure. Some teach while preparing for their specialty boards. In general, they profit as well as the first-year students by these experiences (see Chapter VII).

Most department chairmen would like to have one full-time teacher for each 20 students in the basic courses in anatomy, or about a 30 per cent increase over existing student-teacher ratios on the average (Table 4.15). The student-teacher ratios ranged from 1 to 10 in courses in gross anatomy in 4 per cent of the schools to 1 to 50 or more in 8 per cent of the schools.

TABLE 4.15

ACTUAL AND PREFERRED TEACHER-STUDENT RATIOS
(Chairmen group)

Staffs on which ratios are based	Median teacher-student ratios			
	Gross anatomy	Histology	Embryology	Neurology
Present actual				
Full-time	1 to 30	1 to 30	1 to 30	1 to 30
Full-time and part-time plus teaching assistants	1 to 15	1 to 20	1 to 20	1 to 20
Desirable				
Full-time	1 to 20	1 to 20	1 to 20	1 to 20
Full-time and part-time plus teaching assistants	1 to 15	1 to 15	1 to 15	1 to 15

TABLE 4.16

EMPHASIS ON HISTORY OF MEDICINE AND ANATOMY

(Chairmen group; Multiple response)

Historical emphasis through:	% of 89 responding departments*
None	24
Lectures	56
Student library projects	9
Other	37

*Total N = 90; no response = 1%.

History of anatomy

Courses in anatomy, one of the oldest medical sciences, gave some attention to the history of the subject or to the history of medicine in all but 24 per cent of the schools (Table 4.16). Usually the subject was presented by lectures. Actually over half of the students (58 per cent of 560 fourth-year students) stated that they had been introduced to a brief account of the history of anatomy, either given as separate lectures or as part of a course in the history of medicine. Interestingly, 61 per cent of the 234 who had not had an introduction to the history of anatomy would have welcomed such a course. Only about 80 of 560 students either did not have or did not want a brief account of the history of medicine.

Use of new techniques

The different aspects of a subject are frequently defined within technical limitations. This is too often true in anatomy; gross anatomy is limited to dissection, and histology limited to light microscopy. Members of departments of anatomy will sometimes admit that they are histochemists, electron microscopists, endocrinologists, and the like, rather more readily than that they are anatomists. In so doing they are characterizing themselves by the techniques they employ in their research. Greater emphasis inadvertently may be put on technique than on content. The Planning Committee asked for the "courses in which medical students are introduced to the use of new research techniques" in spite of the implication in such phrasing that techniques might be more important than the problems or the concepts to be elaborated or amplified by the application of new techniques. Technical advances do contribute much to scientific expansion in morphology as well as in other disciplines; they are changing continually (see Chapter V). The Committee was well aware, however, that techniques should be applied to problems, not problems created for techniques. The question was asked for two reasons: (1) it emphasized the multiplicity of technical methods contributing to our concepts of morphology, and (2) it seemed to be the only direct way that the desired information could be acquired, since techniques can be stated more specifically than the problems to which they are applied.

Fifty-three schools disclosed that they had introduced the "newer" techniques in connection with courses in histology and 28 schools introduced newer techniques in courses in neuroanatomy. On the other hand, only

TABLE 4.17

RECENT ADVANCES INCORPORATED INTO ANATOMY TEACHING

(Faculty group)

(*Question:* Do you incorporate in your teaching of anatomy recent advances in electron microscopy, histochemistry, and radiology?)

Response	% of 487 faculty members		
	Electron microscopy	Histochemistry	Radiology
Yes	52	55	43
No	35	31	37
No response	13	14	20

about half of the faculty reported that they applied the two most frequently mentioned techniques, electron microscopy and histochemistry, to their courses (Table 4.17). *(Anatomists need not be considered to be hypocritical here, however, as this figure must approach 100 per cent of those who teach microscopic and neuroanatomy. Wording of some questions could have been improved.* ED. One might ask, "Do anatomists teach the older techniques?" The preparation of a blood smear for a differential cell count or of a histological preparation for examination with a light microscope may have some practical value. Many of the exercises of this type are omitted with larger classes and reduced time. Nevertheless, the principles involved in these techniques are usually discussed and probably most students profit as much from this as from the more manual laboratory exercises.

The older technique of dissection was considered by some to be a slow and tedious way to learn anatomy but no one thought it should be supplanted. Rather, it should be supplemented by the newer techniques of radiography, myography and special injections.

Improvement of teaching

The answers to the open-end discussions relating to teaching performance and improvement are tabulated in Table 4.18. Most of the anatomists replied to this question and a few mentioned several ways in which teaching performance might be improved. The more frequent suggestions favored (1) constructive intradepartmental discussions and criticisms, and (2) additional or objective evidence for the recognition and appreciation of teaching ability. Many teachers apparently thought that research was overemphasized.

As stated in the Introduction, the anatomists of 50 years ago were campaigning for a more experimental approach and less didactic, empirical teaching. Today the pendulum has swung so far in the other direction that some anatomists wonder about how much emphasis to put on sheer teaching ability. Departmental programs sometimes seem more directed toward the development of research institutes than toward academic teaching units. Some respondents wished for a statement on over-all school and departmental objectives. The general impression elicited was that teaching was taken reasonably seriously, in a rather unimaginative manner. Anatomists could improve the situation immeasurably themselves if given more staff and

TABLE 4.18

FACULTY SUGGESTIONS FOR IMPROVING TEACHING PERFORMANCE
(Faculty group; Multiple response)

Suggestion cited	Frequency
1. *Suggestions aimed at bringing about increased emphasis on improvement of teaching performance*	
Have staff discussions, seminars, luncheons	89
Create favorable environment for teaching; e.g. increase available funds, facilities, salaries, tenure	76
Equate research ability and output with teaching ability and performance in selecting teachers and in evaluation of staff in terms of advancement and salary increases	68
Emphasize teaching performance as basis for selection of teachers and in staff advancement and salary increases	50
Make teaching more attractive as a profession	35
Increase personal responsibility of teachers, allow more freedom in method of approach, encourage young teachers	25
Revised and/or improved curriculum and courses	22
Allow more elective programs	2
Other	33
Total number of faculty members responding in category 1 of question	(317)
2. *Replies suggestive of ways of bringing about improved teaching*	
Enlarge staffs (or more favorable teacher-student ratio)	26
Utilize student and former student opinions and evaluations	24
Establish teaching standards, objectives, policy, philosophy	22
Correlate teaching of anatomy, physiology, and pathology	19
Utilize criticism by colleagues	12
Increased research activity on part of teaching staff	5
Measure or appraise teaching proficiency of individual staff members	4
Other	40
Total number of faculty members responding in category 2 of question	(137)

TABLE 4.19

FACULTY SUGGESTIONS FOR EVALUATING TEACHING PERFORMANCE
(Faculty group; Multiple response)

Suggestion cited	Frequency
1. *Suggested methods of evaluation*	
Student reactions (opinion, evidence of enthusiasm, etc.)	174
Results of student examinations	89
Student success in later courses or career	49
Colleagues' evaluation	23
Observation of lectures, laborstories, etc.	10
Self evaluation	10
Observation of teacher's reaction to the teaching situation	5
Evidences of teacher's scholarship, ability, knowledge, etc., in given field	3
Other	5
Number of faculty members responding in category 1 of question	(233)
2. *Responses in terms of characteristics that should be evaluated*	
Quality of presentation (e.g., clarity, ability to express self, etc.)	123
Ability to stimulate student interest and activity	98
Teacher's ability, knowledge, etc.	86
Interest in and enthusiasm for course and teaching in general	67
Interest or concern in, and fairness in consideration of student problems and/or welfare	60
Quality of lectures (e.g. adequacy of preparation, organization, etc.)	53
Ability to keep up with advances in the field	19
Quality and/or kind of examinations developed by the teacher	9
Research output	6
Other	12
Number of faculty members responding in category 2 of question	(246)

facilities, and if they knew that their efforts would be recognized. If teaching in anatomy is to be improved, every effort must be made to retain and obtain good teachers and to give them, insofar as possible, the facilities with which to work.

How can good teachers be selected and how can their effectiveness be appraised? Most anatomists thought that student opinion and the results of student examinations gave the best criteria for evaluating teachers (Table 4.19). Self-evaluation was rarely considered significant, and the opinion of colleagues were not valued too highly.

The qualities most frequently to be sought in a good teacher were: (1) clarity of expression, (2) capacity to stimulate student interest, and (3) ability and knowledge of his subject. Other qualities of personality and character were also emphasized repeatedly.

Methods of improving the quality of teaching were discussed at length at some sessions of the Institute. Anatomists might give more thought to course content and methods of presentation. Occasional colloquies on teaching at the meetings of the American Association of Anatomists might stimulate more interest in teaching human morphology (Table 4.20). Some

TABLE 4.30

FACULTY OPINIONS ON TEACHING PROBLEMS SESSIONS

(Faculty group)

(*Question:* Would you recommend that anatomists carry on periodic sessions on teaching problems?)

Rank	At summer conferences			As programs associated with annual AAA meetings*			As programs initiated in local school setting			Other sessions		
	% Yes	% No	% No response	% Yes	% No	% No response	% Yes	% No	% No response	% Yes	% No	% No response
Chairman (N = 75)	17	44	39	66	21	13	43	21	36	12	15	73
Professor (N = 76)	10	45	45	56	24	20	29	28	43	12	8	80
Associate professor (N = 116)	17	35	48	64	21	15	48	15	37	9	7	84
Assistant professor (N = 116)	14	42	44	66	24	10	45	22	33	3	12	85
Other (N = 104)	29	28	43	62	16	22	50	17	33	6	8	86
Total faculty (N = 487)	18	38	44	63	21	16	44	20	36	8	10	82

*American Association of Anatomists.

anatomists expressed a real interest in acquiring additional familiarity with learning theory and practice. Others were quite content with their own ideas and prejudices. Few were in favor of formal workshops on teaching techniques. Most participants seemed to think that discussions of teaching methods and ideas might be stimulating and in the long run result in improvements, but that they could not be introduced overnight.

Time for anatomy courses

The amount of time in hours required to present courses in anatomy was discussed frequently. Sometimes, in spite of decrease in allotted time, the performance expected of the students did not decrease proportionately. The number of hours assigned to the courses in anatomy did not necessarily mean that the different courses presented more or less material or that the students learned more or less anatomy. One conference group suggested the following as minimal requirements: gross anatomy, 300 hours; histology, 150 hours; neuroanatomy, 90 hours; embryology, 80 hours—or a total of 620 hours. These figures conform quite closely to the average lengths of the courses as now given.

Whether students taking courses in those schools that require only half the time assigned to these courses in other schools learned anatomy in proportion to the length of the courses was discussed; but no objective data were available whereby this question could be answered. Should the evaluations be made at the end of the first, second, or fourth years? To what extent can courses in anatomy prepare a student to familiarize or refamiliarize himself subsequently with these subjects? Again, opinions were not uniform. The general impression seemed to be that basic courses were introductory and did not represent terminal learning in anatomy.[4] Additional knowledge of anatomy would continue to be acquired throughout life by those doctors of scholarly interests and those whose activities required it. Basic courses in anatomy should be designed chiefly to motivate students of human biology and medicine to continue learning human morphology throughout their educational period, or even their lives.

The time required for students to acquire enough proficiency to permit subsequent independent study was discussed but again without agreement. Some anatomists thought that that was about all that was now being done. Some clinical teachers stated that reviews of anatomy were necessary in relation to instruction of their specialties. Or was it just review? The question was raised in one discussion group that perhaps the real problem here

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[4]It appeared that most participants were thinking about the best ways of presenting a course—and most frequently gross anatomy was being discussed—rather than of assisting students to acquire some knowledge of human morphology. The courses would suffer, or not be so good, or would be better, if such and such were done. Perhaps more attention should be given to achieving greater results from the course. Ed.

was not the length of time required to present a course but the length of time required to learn the subject, and the value of repetitive experiences in the learning process. The question then became, how much learning is enough and when in the educational process should the anatomical learning experiences be supplied. The anatomists almost all thought that these experiences should be predominantly in the first year. (See Chapter VII for upperclass and postdoctorate instruction). Thereafter the student, with optimal background experiences and adequate opportunities, could probably instruct himself.

V

Stimulus of Research on Teaching Anatomy

"The medical school should be a place where medicine is not only taught but also studied."—W. H. WELCH, 1893

THE MOST RAPID advances in any field of knowledge characteristically follow the application of new approaches to learning, whether these consist simply of fresh points of view or include the utilization of new skills or techniques. The precocious rise of anatomy in the sixteenth century as the first of the medical sciences is illustrative of such acceleration, for it derived chiefly from personal observation in dissection, employing little apparatus beyond the scalpel, and was thus independent of technical advances, either in anatomy itself or in other sciences. The remarkable Renaissance triumvirate of Leonardo, Vesalius and Eustachius, in abandoning subservience to Greco-Roman-Arabic authority and exploring for themselves the structure of the human body, inaugurated enthusiastic programs of research in gross anatomy which dominated this field from the sixteenth to the eighteenth centuries.

A subsequent major advance in anatomical knowledge reflects the acceleration which followed upon the development of a new technique, adapted in this case from the field of optics. The medieval prediction of Roger Bacon that, with application of principles of perspective, "we might number grains of dust and sand, owing to the magnitude of the angle under which we view them," began to be realized in the early microscopic studies of Hooke, Leeuwenhoek and Malpighi and later swelled to the flood of research in microscopic anatomy—including histology, embryology and neuroanatomy—that has dominated anatomical investigation in the nineteenth and first half of the twentieth centuries.

The organization of the anatomical curriculum in most medical schools today reflects these two great early advances in knowledge in this field. The student of 1956 begins his medical education with gross and microscopic anatomy.

New techniques enlarge scope of anatomy

It was apparent from discussion at the Teaching Institute, and the replies to the questionnaires, that a third great advance in anatomical knowledge is taking place today, possibly of broader scope and more rapid acceleration than either of the two historical milestones that have marked anatomical development thus far. The forces effecting this current spurt of growth are epitomized in the Hughlings Jackson epigram that "anatomy should not be confounded with morphology," and reflect the growing opinion that the anatomist may concern himself with function as well as with structure, and indeed should do so, as he is frequently in a uniquely favorable

position to contribute to the functional significance of morphology. This altered outlook is carrying anatomical investigation across boundaries into physiology and its daughter fields, biochemistry and biophysics, with such abandonment that it becomes questionable whether the preservation of these boundaries is desirable or even convenient. Certainly it is apparent that such boundaries no longer serve as barriers.

If the research advances of today determine the curricular development of tomorrow, which is the first lesson of the history of science and medicine, what implications are to be drawn from the fact that it is today commonplace for the anatomical investigator to utilize spectrophotometry, electrophoretic chromatography, isotopes and scintillation counters, radioautography, stimulators and other biophysical and biochemical devices?

Emphasis and content changes

It was repeatedly emphasized at the Institute that such revolutionary changes as are taking place in anatomy must inevitably affect the emphasis and content of much of the subject matter presented in anatomical courses, with inevitable sacrifice of classical material. The introduction of new material, it was thought, would benefit the student by emphasizing that knowledge is never static, but is continually changing in scope and interpretation. The statement was made that "the half-life of truth is getting shorter and shorter," and that we have an obligation to present new material so that the students will have a basis for understanding future advances in medicine after their formal education is completed.

New techniques utilized from other sources

The importance to anatomy of discoveries and technical advances made in other fields was underscored in discussion. In one group the use of electromyography for teaching living musculature was extolled. By using such a technique for other purposes both in teaching and research, the entire cost of the instrumentation could be spread over several research projects or even interdepartmentally. The question was raised whether the application of electromyography in gross anatomy might be technically too difficult for the untrained individual. This led into a discussion of the availability of other teaching and research techniques that could only be effectively used after special training.

The utilization by anatomists of new methods developed in other sciences has greatly facilitated the amount of information they can convey to the student, without increasing the time devoted to anatomy, although some classical material has been sacrificed in order to allow the incorporation of new ideas. Among the important influences from other fields were listed electron microscopy, histochemistry, and the use of isotopes for tracer and radioautographic studies. Experimental embryology influences the teaching of gross anatomy as well as neuroanatomy. More understanding of the function of muscle groups has come from neurophysiology and experimental embryology. Endocrinology has brought purified pituitary and steroid hormones that have increased insight into growth and metabolism and their influence on many gross and microscopic structures. Anthropology

has given a concept of human variability. Surgery has brought greater knowledge of lung segmentation. Advances in the technique of tissue culture has made this simple and cheap enough to be used as a routine teaching method. These were mentioned as only a few among the numerous examples of technical advances incorporation of which into anatomy has contributed greatly to improved teaching.

Contribution to many specialties

Anatomy has also contributed significantly to other specialties. From anatomy have arisen a number of subspecialties. A few examples of such areas stemming from anatomical investigation are the field of hematology; the first hormonal discoveries and the field of endocrinology; the first synthesis of a vitamin; Donaldson's basic contributions to nutrition and other fields; the early work on mitochondria; the reticuloendothelial system, etc. These specialties have developed from the perfection of new techniques and have resulted in separatist movements, to the detriment of anatomy as a whole.

The recent trend in science toward greater detail and subdivision of research fields would, it was hoped, later give way to synthesis of detail and recombination of the research groups. In conclusion, in the words of one participant, "For the future, no man can foretell what the advances in techniques will make possible, but it is certain that anatomists will continue in the forefront of the advances in medicine. Too few of our colleagues in other fields are cognizant of the debt owed to anatomical research. Whatever new techniques may be added will fail to alter the fundamentally anatomical nature of the investigations."

As an example of the impact research advances have made on teaching anatomy, attention was called to the fact that some of the representatives at the Institute from other disciplines betrayed misconceptions about anatomy which stemmed from their outdated experience with it years before. Some of these comments about anatomy, which sounded to those teachers present strange or untrue, emphasized for all some of the changes that have taken place in the teaching of anatomy even during the past 20 years.

Proposals for utilizing new material

Among methods suggested for incorporating newer research findings into the curriculum was the proposal that an anatomical review be published, summarizing developments in all branches of anatomy. Symposia on new research developments might be held at annual meetings of the American Association of Anatomists in order to acquaint teachers and research men with new techniques and give them some degree of proficiency in their operation. Small geographically located groups of anatomists might meet to discuss problems related to teaching and research in a manner similar to the New York or Midwest sectional meetings (See Table 4.20).

It was also suggested that the American Association of Anatomists should appoint a committee to study the possibility of arranging a Teaching Institute to coincide with annual meetings, which would extend the influence of the current Institute. In addition, it was proposed that the National

Institutes of Health might wish to explore the possibility of extending their training grant programs, heretofore confined primarily to various clinical fields, to basic science areas; to provide anatomy departments, for instance, with equipment and material to aid in teaching new fields of knowledge.

Increased interest in integration of course material

From discussion sessions and questionnaires came indications of varying degrees of interest and activity in more extensive boundary-crossing in the medical curriculum. In many of our schools, anatomists are invited to participate in the teaching programs of other departments into whose fields their research interest may extend—the most frequent being neurology, pediatrics, physiology and endocrinology. Sustained teaching integration exists in 40 per cent of the schools between anatomy and other medical sciences, particularly with neurology—reflecting the degree to which boundary-crossing research interests have overcome disciplinary barriers in this area. Such extradepartmental teaching consists to a large extent of regular course work (61 per cent), but 28 per cent involves merely presentation of research findings at seminars.

Conversely, many members of other clinical departments contribute to teaching anatomy in the fields of their interest. Three-quarters of the departments enjoy such participation, which was warmly welcomed by those chairmen of anatomy departments responding to the questionnaire. They expressed unanimous satisfaction with such arrangements.

Approximately 40 per cent of the 90 departments reporting had staffs with joint appointments, chiefly in: surgery (13), radiology (8), neurology (5), dental clinic (4). Of these joint appointees, the median per cent of time allotted to teaching was 23 per cent, to research in anatomy 8 per cent. Approximately 90 per cent of anatomy departments participate in cooperative research projects with other departments. This arrangement was encouraged, according to 84 per cent of chairmen reporting.

Effect of research activities on teaching

Discussion at the Institute reflected the prevailing opinion that research interests usually improve the quality of a man's teaching. In the words of

TABLE 5.1

OPINIONS ON RESEARCH vs. TEACHING INTEREST
(Chairmen and Student groups)

Opinion on teachers	% of chairmen (N = 90)	% of 4th year students (N = 560)
Teachers with research interests are:		
More effective teachers	54	11
Less effective teachers	6	78
No significant correlation	38	2
No response	2	9
Research activities:		
Interfere with teaching effectiveness	19	
Do not interfere with teaching effectiveness	75	
No response	6	
Teachers are more effective presenting subject matter:		
In their own research activity		63
Outside these fields		15
Same		7
No response		15

TABLE 5.2

STUDENT OPINION ON TEACHERS' RESEARCH ACTIVITIES
(Student group)

Question	% of 560 4th year students					% of 395 students*		
	None	Some	Consid-erably	Exces-sively	No response	Yes	No	No response
To what extent did your instruction in anatomy emphasize the subject matter of the current research interests of your teachers?	28	57	12	2	1			
If included, did consideration of current research problems add to the interest of the courses in anatomy?						72	23	5
Do you think that the time spent on research problems in your courses could have been spent more profitably upon other aspects of anatomy?						22	63	15

*Number of 4th year students reporting current research was included in instruction.

one participant, the teacher interested in research "brings a sparkle and stimulation to his work which captures the student's interest." Without research interests, it was frequently stated, there might result sterile and uninspired teaching. Almost all departmental chairmen (89 per cent) stated that research activities enhanced teaching effectiveness.

A sharp disagreement with this point of view was evident in student replies to the questionnaire. More than three-fourths of 560 fourth-year students in the sample were of the opinion that strong research interests made for less effective teaching. Only 11 per cent thought that persons with strong research interests were more effective teachers. In contrast, 54 per cent of departmental chairmen shared such a view (Table 5.1) and 75 per cent stated that research interests did not interfere with teaching.

However, when this problem was approached from a different point of view, and students were asked if the inclusion of current research problems added to the interest of anatomy courses, nearly three-quarters were inclined to admit that it did. Almost 25 per cent of the 395 students who stated that current research was included in instruction thought that the time could have been more profitably spent on other aspects of anatomy. Sixty-three per cent considered the time spent on current research problems well spent. Comparatively few students complained of excessive emphasis on current research interests of their teachers (Table 5.2).

These figures prompted discussion concerning the relative value of student opinion as to the effectiveness of investigators as teachers (Table 5.3). Most of the participants felt that student opinion on this question was not too reliable. There was general agreement that the investigator may be a good or a poor teacher but with few exceptions it was practically impossible to have a good teacher who was not at the same time a good investigator.

Emphasis in teacher selection

The teachers of anatomy should be selected for research interest as well as teaching ability. Instructors combining investigative promise and teaching ability must be continuously sought. The majority of departmental chair-

TABLE 5.3

STUDENT OPINION ON RESEARCH AND ADMINISTRATIVE ACTIVITIES OF INSTRUCTORS
(Student group)

Is instruction affected by:	4th year student response on resulting decrease in:							
	Amount of instruction				Quality of instruction			
	% Yes	% No	Responding N	% no response*	% Yes	% No	Responding N	% no response*
Research activities of your instructors?	24	76	(533)	5	18	82	(524)	6
Administrative activities of your instructors?	28	72	(529)	6	14	86	(523)	7

*No response is stated as per cent of total N = 560 for the fourth year student group. The percentage response is based on responding N in each case.

men (80 per cent) were satisfied that, in selecting new faculty members, they evaluated both teaching ability and research productivity. The remainder were approximately equally divided between those who regarded either one or the other as more important (Table 5.4).

Members of all departments of anatomy should have research interests. Preferably these research interests represented in the department should be diverse rather than specialized in one narrow area, and ideally these research interests should contribute to the over-all educational responsibility of the department and school. Some commented that not all of the effective teaching was done in formal basic courses. With time permitting, those contacts in the research laboratory between teacher and student can be most instructive (see Chapter VI).

Research men who are inclined to neglect their educational responsibilities in deference to their own research interests are probably better suited for positions in research institutes. Much anatomical research is also being done outside anatomy departments. The number of specialized research institutes has increased recently. Also some morphological research is being done by those in clinical departments, often by those with extensive anatomical education or in cooperation with members of anatomy departments.

Anatomists, by and large, because of heavy teaching responsibilities, seem to have greater difficulty in finding time for research than do staff members in some other preclinical departments. Also, as they come in contact with students during the earlier part of their education, they encounter them at the time when the students themselves are least interested in re-

TABLE 5.4

FACTORS IN PERSONNEL SELECTION
(Chairmen group; Multiple response)

Research capacity vs. teaching ability in selecting teachers	% of 89 dept. chairmen responding*
Consider originality and productivity in research more important than teaching skill	12
Consider teaching skill more important than research	10
Consider them of equal importance	80
Other factors considered more important	14

*No response = 1% of total N = 90.

TABLE 5.5

RELIEVING RESEARCHERS OF TEACHING LOAD
(Chairmen group)

Provided for more productive investigators	% of 90 dept. chairmen
Great freedom from teaching	10
Some freedom from teaching	47
No freedom from teaching	40
No response	3

search. Others commented that more first-year students were interested in research than upper-class students, indicating that the experiences of students in basic sciences had not necessarily augmented the number with research interests.

From the questionnaire, it is apparent that a comparatively small number of departments include among their staff full-time research appointees above the fellowship level, and separate from the teaching program. Seventy-nine per cent of the 84 departments reporting had none. The remainder had anywhere from one to three or more such members. Such full-time research men were on tenure in 18 per cent of the 17 departments reporting that they had full-time research appointees. Seventy-six per cent of the research appointees have restricted tenure.

It appears therefore that much of the responsibility for carrying forward research in anatomy falls on the regular staff members, and is undertaken in conjunction with their teaching duties. Some schools recognize the importance of more time for research for those engaged in constructive work in their specialized field and afford them some additional freedom from teaching duties. Nearly half the schools queried, however, made no attempt to lighten the load of the more productive researchers in order to facilitate research (Table 5.5). This lack of consideration of special capacities may reflect in part the budgetary and personnel limitations of many departments.

TABLE 5.6

CHANGES IN FACULTY RESEARCH AND TEACHING INTERESTS
(Faculty group)

Faculty rank	Interest has (% response):			Total N = 487	
	Increased	Decreased	Remained same	Responding N	No response (% of total N)
			Research interest		
Chairman	44	5	51	(73)	3
Professor	54	3	43	(74)	3
Associate professor	51	6	43	(114)	2
Assistant professor	59	1	40	(111)	4
Associate, fellow, lecturer, instructor, assistant	68	2	30	(103)	1
Total	56	3	41	(475)	2
			Teaching interest		
Chairman	29	7	64	(72)	4
Professor	49	12	39	(74)	3
Associate professor	53	4	43	(114)	2
Assistant professor	60	5	35	(113)	3
Associate, fellow, lecturer, instructor, assistant	67	3	30	(103)	1
Total	53	6	41	(476)	2

Changing levels of interest in research

Interests in both research and teaching increase with experience (Tables 5.6, 5.7). The majority of the chairmen were of the opinion that their interests had remained the same in these areas, possibly because of the original high level of their motivation and enthusiasm (Table 5.6). Among those who deemed themselves more interested in research now than previously, reasons given ranged from the stimulation of past research and associations, the expansion of knowledge, bringing with it more appreciation

TABLE 5.7

FACULTY COMMENTS ON CHANGES IN RESEARCH AND TEACHING INTERESTS

(Faculty group; Multiple response)

Increased interest and enthusiasm for:	Frequency
Research	
Interest has been stimulated by past or present research and/or associations	86
Scope of knowledge has increased	47
Increase in funds and/or facilities	20
Teaching or student contacts have stimulated interest	15
Increased appreciation of value	10
More time available	8
Starting on new research program	6
Other	23
N (Number of individuals reporting increased interest and commenting)	(192)
No response (Of those reporting increased interest)	73
Teaching	
Personal satisfaction derived from teaching	46
Increased knowledge or competence has increased interest	39
Interest stimulated by student contacts	37
Consciousness and/or knowledge of teaching problems has increased	30
Increased responsibility has increased interest	15
Find teaching helps or stimulates research	9
Other	22
N (Number of individuals reporting increased interest and commenting)	(178)
No response (Of those reporting increased interest)	76

TABLE 5.8

STUDENT RESEARCH IN ANATOMY DEPARTMENTS

(Chairmen group)

Item on student research (1950-54)	% of 69 depts. describing student research*
Proportion of students engaged in research projects	
Less than 1%	12
1—3%	52
4—6%	23
7—9%	1
10% or more	12
Time student research projects undertaken	
During the summer	57
Throughout the year	16
Both during the summer and throughout the year	14
During a year of full-time investigative activity	13

*No response = 23% of total chairmen N = 90. Out of the 90 departments, 79% have student research programs, 20% do not, and 1% did not respond.

of the importance of research, and the availability of more funds and facilities for it (Table 5.7). The 13 whose interest had declined implicated the demands of other obligations or inadequate rewards. Teaching interest, similarly, was compounded through experience, plus growing competence and the opportunity for student contacts (Table 5.7).

Research for the medical student

Discussants at the Institute devoted considerable attention to the importance of research experience for the student himself as a part of his medical training. In modern medical education it is essential for the student to have the opportunity to make direct as well as didactic contact with research methods and results. Opinions differed on how this could best be accomplished. Some favored the project approach in the laboratory portions of regular courses. Others pointed to long-established programs requiring the student to prepare a research thesis; others favored opportunities for voluntary participation in research during the summer, and still others, opportunities in elective courses.

The value of project teaching elicited most discussion. In a histology course emphasizing histochemistry or any other currently active area of research, for example, project teaching might have to be done at the expense of other conventional types. This posed the question as to what should be dropped from the regular material to make possible class or group projects. One teacher mentioned successful projects had been undertaken in endocrinology and thought the method might have wider application in this and other areas. It was noted that conventional methods of teaching would have to be subordinated to accommodate such a project. The enlarged or modified facilities and probable need of additional teachers might tend

to limit the project approach. It would probably be most effective for small classes or selected parts of classes.

Research experience during medical school might improve the future physician's capacity to solve problems presented by patients, provide a background for individual investigation, whether in preparation for subsequent careers of science or clinical medicine, or simply to encourage keeping abreast of progress in medicine. In this connection it was pointed out that "some talented students learn to do research without the assistance, even in spite of, the teacher—i.e. Vesalius."

Although 79 per cent of anatomy departments have some type of research fellowship programs for medical students, frequently during the summer, no more than 12 per cent of the departments responding stated that 10 per cent or more of their students were involved in such programs. In more than half of the schools, a bare 1 to 3 per cent did research in anatomy (Table 5.8).

The preponderance of anatomy teachers polled stated that they did not supervise or direct student research projects as a regular part of teaching (Table 5.9). Reasons for not undertaking such projects included lack of space, time, funds, staff, size of student body, and even some doubt on the part of the faculty as to the value of such projects. Other reasons occasionally mentioned were simple failure to make research projects a regular part of curricular policy, lack of interest among students, and nonexistence of a graduate program. Nine admitted that they were not qualified for this type of teaching.

TABLE 5.9

REASONS STUDENT RESEARCH PROJECTS ARE NOT SUPERVISED*

(Faculty group; Multiple response)

Reasons cited by those not supervising student research		Frequency
Question the value of such projects		55
Inadequate space, time, funds		218
Inadequate staff		107
Too large a student body		103
Lack of student competence		28
Other:		161
Students lack time	47	
Not current policy	22	
Students lack interest	11	
No graduate program	10	
Instructors lack time	9	
Not qualified	9	
New faculty member	7	
There is opportunity for research in the laboratory, without a formal program	5	
Considering it now	5	
Too few students	4	
Too few graduate students	4	
Students are not ready for it	4	
Not encouraged	4	
Have no students assigned	3	
Opportunity is presented in electives	2	
Have opportunity during summer only	2	
Not part of duty	2	
Not interested	2	
One each of the following: opportunity is presented in research courses, is not considered a teaching aid, is not necessary, courses are too stereotyped, no opportunity in gross anatomy		
N (No. reporting no supervision and indicating reason)		(375)
No response (of those reporting no supervision of research)		4

*Out of 487 faculty members, 77% did not supervise student research, 22% did supervise research, and 1% did not respond.

TABLE 5.10

FIELDS OF STUDENT RESEARCH ACTIVITY
(Student group; Multiple response)

Fields cited by the 39% of 560 4th yr. students participating in research	Frequency	Fields cited (cont.)	Frequency
Allergy	1	Metabolism	2
Anesthetics	2	Microbiology	1
Anatomy	10	Neurology	3
Anticonvulsants	3	Nutrition	5
Bacteriology	10	Obstetrics-gynecology	8
Biochemistry	28	Parasitology	3
Botany	1	Pathology	12
Cancer research	6	Pediatrics	8
Cardiac and thoracic surgery	1	Pharmacology	26
Cytology	2	Physiology	46
Dermatology	2	Polio research	3
Electrocardiography	1	Psychiatry	4
Electromyography	1	Respiratory	1
Embryology	1	Salicylism	1
Endocrinology	20	Sensory	1
Genetics	1	Surgery	7
History of medicine	4	Tumor growth	3
Histology	6	Urology	7
Internal medicine	3	Vascular	24
Joints	2	Virology	2
Lab procedures	1	Visceral	4
Laryngology	1	TOTAL	278

Minority of students undertake research

Among 560 fourth-year students queried as to the extent of their participation in research activity while in medical school, 61 per cent had no experience. Among the 219 students who had undertaken some research project, the following fields were most popular: physiology 46, biochemistry 28, pharmacology 26, endocrinology 20, anatomy including histology 16, pathology 12, bacteriology 10, etc. (Table 5.10). Three-quarters of the students undertook such research because of general interest in gaining experience, because they were interested by an instructor, or through a problem they had conceived themselves. About 25 per cent participated in research primarily because of need for financial remuneration (Table 5.11). A good half of the students who got through medical school without any experience in research would in retrospect have welcomed the opportunity for it.

Valuable contributions have been made to science by men still in medical training, a point worth emphasizing to students occasionally. Jenner, Langerhans, Ehrlich, Sanstrom and Best during their student days accounted for some major advances in the field. Making important discoveries through research is, therefore, a goal to be kept in mind as not beyond the capacity of students today.

Research grants

Considerable attention was given to the impact of research grants on teaching and research in departments of anatomy. The benefits of such grants were self-evident. On the other hand, it was thought important to be alert to possible abuses in practice. Research projects initiated or directed solely by outside agencies or the school administration could be dangerous to academic and departmental morale. The existence of research grants some-

TABLE 5.11

STUDENT REASONS FOR RESEARCH PARTICIPATION

(Student group; Multiple response)

Reasons cited by 4th year research participants	% of 219 students*
It was a specific requirement	26
Of an interest in a problem I conceived	24
Interested by instructor	37
General interest in gaining research experience	49
Financial remuneration	27
Other	6

*Out of a total N of 560 for the 4th year group, 341 students indicated they did not participate in research.

times leads to the failure of school administrators to assume their full share of responsibility for promoting research, through over-reliance on such grants. Administrators, legislators and the public must be aware of the fact that research is their responsibility and cannot be shifted entirely to agencies granting research funds. Furthermore, investigators who rely largely on one or more sources of funds arising outside the school, in addition to spending the time and effort required for project applications, must share a loyalty and concern for the granting agency and somewhat less concern for their own institution's over-all program.

One problem that was frequently posed by grants for research was the inadequacy of accompanying funds to administer the grants. The recent increase of overhead allotments to 15 per cent on grants from several agencies was regarded as an improvement.

The question was raised as to whether normal departmental funds for research had been reduced because of the availability of research grants. Replies from the discussants indicated that this had not occurred. However, departmental funds for research had not increased, as might have been expected in view of the increased responsibility of departments for the development of research.

Concern was expressed lest outside agencies attempt to dictate the character of research facilitated by their grants. One group recommended the following proposals to circumvent this: (1) The university strive to obtain funds for emergency and interim periods, these to be handled by a faculty or departmental committee. (2) Block grants to a responsible investigator, as is done by the National Research Council of Canada, to further whatever project he deems advisable. These grants should be automatically renewable. (3) Where a research project is designed to cover several years, the granting agency should extend support for duration of the project.

The best way to promote and support research is to provide unencumbered funds. Some state legislatures are currently appropriating funds not earmarked for specific projects. In one state, it was reported, a portion of funds raised by public subscription was allocated to the medical schools for general research. Categorical allocations frequently hamper the development of new research programs. Fluid funds, on the contrary, make it possible to initiate pilot studies, increase general research facilities, and strengthen graduate

student research programs when universities fail to provide adequate budgets for this purpose.

Although large research funds from private sources are less plentiful than previously, funds might be obtained from local sources if the universities would assume the initiative. The charge was made that funds from grants were sometimes diverted from the projects for which they were designated to pay for the cost of basic instruction. This was generally regarded as morally indefensible. Some teachers thought however it was justified to some extent since it aided the development of general research facilities. There was sharp difference of opinion concerning the diversion of funds for other purposes than the research for which they were given.

Three of 12 participants in one group said their research budgets were sufficient. The others felt they could not get along, either in teaching or research, without grants.

VI

Recruitment and Training of Anatomy Teachers

Thus in the future, as in the past, there will still be employment for anatomists in medical education—still an opportunity for the anatomist to supervise the students' work on human structure, still the rare and priceless privilege for the anatomist to cultivate and encourage an intellectual curiosity in the medical student, and still problems requiring attack by the anatomist. L. H. WEED, 1933.

Shortage of anatomists

THE SHORTAGE OF anatomists in medical schools was underscored throughout all sessions of the Teaching Institute. In reply to the questionnaire, 71 chairmen reported 46 departments with a total of 54 budgeted vacancies, at ranks ranging from instructor to professor, in 1955-56 (see Table 1.5). A need for a greater number than this was widely expressed, although not provided for in budgets. Thirty-nine chairmen thought that more anatomists were required for adequate instruction beyond those budgeted, and 58 regarded the acquisition of more as desirable. One departmental chairman stated that he needed four additional teachers; four needed three more staff anatomists (Table 6.1).

Enough new anatomists are not emerging from the ranks, although many medical and graduate students are adequately qualified for careers in anatomical teaching and research. Most of these enter medical practice, another of the basic sciences, or research or industrial laboratories.

TABLE 6.1

ADDITIONAL BUDGETED POSITIONS NEEDED
(Chairmen group)

Rank of desirable or necessary position	Number of chairmen indicating personnel need (total N = 90)										
	1 more position		2 more positions		3 more positions		4 more positions		More positions (unspecified)		No more positions
	Nec.	Des.	Nec.	Des.	Nec.	Des.	Nec.	Des.	Nec.	Des.	
For instruction of medical students											
Professor	2	2	0	1	0	0	0	0	0	0	
Associate professor	3	3	0	1	0	0	0	0	0	0	
Assistant professor	7	5	1	1	1	0	1	0	0	0	
Instructor	4	6	2	6	2	2	0	0	0	0	
No rank specified	2	0	2	4	1	0	0	2	11	24	
Total	18	17	5	13	4	2	1	2	11	24	16
For instruction of dental students											
Professor	0	0	0	1	0	0	0	0	0	0	
Associate professor	0	0	0	1	0	0	0	0	0	0	
Assistant professor	3	1	0	0	0	0	0	0	0	0	
Instructor	0	5	2	1	0	0	0	0	0	0	
No rank specified	1	0	0	1	1	0	0	1	3	3	
Total	4	6	2	4	1	0	0	1	3	3	6

The problem is not a new one. In 1945-46, there were 23 budgeted vacancies at academic levels reported by 46 chairmen; in 1951, with 55 chairmen reporting, there were 37 (see Table 1.5). The war years undoubtedly contributed to the earlier manpower deficit. Sixty-six per cent of the 90 departmental chairmen responding currently regard staffing as a real problem.

Reasons for shortage explored

The discussion groups explored some of the reasons for the relative scarcity of young anatomists. Budgetary deficiencies were most frequently cited as a reason for failure to maintain an adequate staff and probably contributed most extensively to the failure to attract or hold young teachers and scientists (Table 6.2). The heavy teaching load and the failure of the subject matter to attract students also were given as reasons for staffing difficulties. Surprisingly, 9 per cent of the 560 fourth-year medical students stated that their experiences in anatomy aroused an interest in a career in anatomical teaching and research. Obviously this interest succumbed to others before realization.

TABLE 6.2

PROBLEMS IN STAFFING DEPARTMENTS
(Chairmen group; Multiple response)

Reasons cited for staffing problems	% of 59 depts. with problems*
Inadequate budget to maintain sufficient personnel at prevailing salaries	80
Failure to attract new people into the field	63
Failure to hold young people who may enter the field	40
Men have been tempted to other teaching positions	34
Subject matter of anatomy does not attract teachers	20
Teaching load too great to allow adequate time for research	14
The teaching staff functions inadequately in attracting recruits	7
Teaching first-year students a basic course is uninteresting	0
The school demands too much training of its teachers	0
Other	19

*Out of a total N of 90 departments, 30% indicated no staffing problems and 4% did not respond.

The general shortage of well educated and intelligent young manpower and the highly competitive search for qualified persons is not unique to anatomy, although anatomists have probably not been as aggressive in recruitment as they should have been.

A lack of understanding or appreciation of the potentialities and scope of anatomy, it was thought, contributed to the failure to attract those interested in teaching the basic medical sciences.

The emphasis given anatomy inclined most people, lay and medical alike, to think of dissection as the major preoccupation of anatomists. On the contrary, the prestige of the profession might be increased by more emphasis on histochemistry, radio-active isotopes, electron microscopy, human growth and development, etc. Few outside the profession today realize that anatomy encompasses a broad diversity of disciplines and techniques, such as neuro-

anatomy, neurophysiology, microscopic and submicroscopic anatomy, cytology, histochemistry, endocrinology, X-ray diffraction and all the specialized fields of anatomy which are lost in the word "anatomy."

Change of name suggested

Many of the discussion groups suggested that thought be given to devising a new name for the department of anatomy, which would more adequately express its present diversity. The semantic connotations of the word anatomy, loaded with the tradition and implications of a past in which its scope was limited more largely to gross human morphology and the technique of dissection fail to encompass the range of meaning inherent in it today. Clarifying this connotation of anatomy might abet recruitment. Several discussion groups favored changing the name of the department of anatomy to that of the department of human biology. Others thought that an even more comprehensive new title might be devised.

Competition from other fields

Basic to the difficulty in attracting new personnel into anatomy is the preference of many scientifically minded young people for careers in industry rather than academic life. An increasing interest in atomic physics and chemistry could be expected to decrease even more drastically the number of students likely to consider a career in one of the basic medical sciences. In competition with these, anatomical sciences are at some disadvantage, due to lack of such outlets as those enjoyed by biochemistry, pharmacology, bacteriology or pathology. The ecology of anatomy, too, is limited since anatomists thrive primarily in the environment of medical and dental schools. Even in departments of biology, it was stated, emphasis on morphology has declined.

Appeal of anatomy research and teaching

The anatomical disciplines, however, in spite of their limited popular appeal, need not necessarily endure a continuous and unalleviated shortage of personnel. Participants at the Institute felt that much more might be done to emphasize the genuine attractions offered by a career in anatomy, in drawing new recruits to the profession. The diversity of the background education of anatomists, ranging through many biological and even the physical sciences, indicates great breadth for recruiting.

The possibilities for research which exist in anatomy have not been stressed sufficiently (see Chapter V). There are no limits to the areas that can be explored in anatomy. The diversity of possibilities in anatomy are evinced in any program of the American Association of Anatomists, and in the Teaching Institute's analysis of current research programs in progress. Anatomists have made vast contributions to the basic understanding of endocrines and vitamins. They have laid foundations too in hematology, neuroanatomy and neurophysiology. Classical descriptive as well as experimental embryology owes much to them. They have upheld the hands of the surgeon as he has developed vascular and cardiac surgery. Although claims are being staked by biophysicists and others, the new fields opening

in electron microscopy are anatomical frontiers, as exciting as must have been the work with the light microscope a century ago when the Abbe condenser and new staining methods made possible the testing of Schleiden's and Schwann's hypothesis.

A career in anatomy also appeals to those with a desire to teach. Many of the rewards and satisfactions hinge on the attractions inherent in this second aspect of the profession. The anatomists present at the Institute obviously liked teaching. As one participant expressed it: "To have a part as scientific interpreter in constant association with young people as they acquire knowledge and maturity and adjust their philosophies is deeply rewarding."

Anatomists have excellent opportunities to inspire and assist medical students, stemming from contact with them during the first and impressionable year. The teaching role therefore at this crucial point in a student's career has a double challenge as it affords a special opportunity for counseling and guidance.

When teaching does not afford the satisfactions that might reasonably be expected, a new look might be taken at the way it is done. Why, for instance, should anatomists persist in teaching the same courses in the same way? From year to year at least 73 per cent of the anatomy staff members stay in the same courses, and 87 per cent of the professors (see Table 4.12). Although this may in some cases be best, only 42 per cent of the staff members queried on the questionnaire preferred this arrangement. Thirty-six per cent would prefer to teach different courses periodically. A greater breadth of teaching experience might augment enthusiasm of the students and be more stimulating to the teacher. Courses taught too repetitiously may lose interest and become stereotyped. There was general enjoyment of the comment that "in anatomy no policies of teaching and only certain specimens should be cut and dried."

Factors influencing career choice of participants

The way in which an anatomy career had made its original appeal to the cross-section of faculty members present at the Institute was brought out by personal accounts in several discussion groups. Many appeared to have entered anatomy with no intention of staying in it; they had remained because they liked it. Of 79 chairmen of departments replying to the questionnaire prior to the Institute, 33 stated that they had been drawn in via teaching experience, 34 were attracted via research, and 23 entered the field because a position was available (Table 6.3). Five entered to prepare for a specialty of medical practice and lingered on. Obviously, the reasons given are not mutually exclusive; the 79 chairmen listed a total of 212 sources of influence and attraction to the field. In the discussion sessions, in which a wider cross-section of faculty took part, the majority felt that the influence of an outstanding and inspiring teacher was the greatest single factor which had attracted them into anatomy, and would remain the most effective means of recruitment. The fact that almost one-fourth of the anatomists (204 of 838) had attained their highest earned degrees from six institutions may suggest the dominant influence of inspiring teachers (see Table A.11).

TABLE 6.3

REASONS FOR DEPARTMENT CHAIRMEN'S CHOICE OF CAREER IN ANATOMY
(Chairmen group; Multiple response)

Reasons cited for entering the field	Chairmen response	
	Frequency	Per cent of N = 79
Influenced by teaching (own experience and/or contact with good teachers)	33	41
(a) Liked teaching and working with students	16	20
(b) Influenced by one or more professors	12	15
(c) Teaching experience before medical school	4	5
(d) Teaching experience during medical school	3	4
Interest in or experience with research	34	42
(a) Liking for research and the time allowed for it in anatomy	16	20
(b) Fellowship experience	4	5
Influenced by particular appeal of this field of study or some aspect of it	36	46
Entered field because a position in it was offered	23	29
Changed from biological field to anatomy	15	19
Entered field because salary scale was better	8	10
Entered field to prepare for special form of practice, then stayed	5	6
Changed from clinical fields to anatomy	3	4

More vigorous recruitment efforts urged

There was unanimity among discussants at the Institute that a more concerted effort should be made to enlist the interest of more promising young people in anatomy. Thought was given several areas toward which this might be directed.

Medical graduates were for many years the only source of anatomy teachers, but today less than 40 per cent of the listed anatomists, and only 31 per cent of the staff members of anatomy departments at the rank of instructor or above, are doctors of medicine (see Table A.9). As the number of medical students becoming anatomists decreased, more emphasis was placed on encouraging qualified students in the basic sciences to consider anatomy as a career. The stronger appeal and greater financial reward of medical practice undoubtedly contributed to this change but the greater emphasis on the research approach afforded by graduate education gave the Ph.D. certain academic advantages.

This means additional recruitment efforts should be directed toward (1) getting more undergraduate students in colleges to consider graduate work in anatomy, and (2) attracting to anatomy some of the graduate students pursuing one or the other of the basic sciences. Because the latter do not enjoy an overabundance of graduate students, this source would probably be insignificant.

Publicize career opportunities in anatomy

To this end, a stepped-up program of college recruitment, directing the thoughts of science-minded students during these years toward the study of human biology, should be encouraged. Attractive brochures describing opportunities in these fields might be distributed, preferably in conjunction with visits of selected anatomists to college campuses where they could meet with interested students. School vocational guidance counselors and science teachers might be informed of openings in anatomy and connected fields. The wider career opportunities afforded by anatomy today should be emphasized. Undergraduate students might be invited to medical schools to explore professional training possibilities with interested teachers. Courses in human

biology might be offered during summer sessions for senior college students. They would include enough human anatomy to prepare students to start as laboratory assistants, or at least test their interest in the field.

Graduate students are more likely to undertake advanced study in biology and zoology because student advisers in undergraduate colleges are more familiar with these subjects than with the anatomy programs offered by medical schools. Opportunities for graduate work in the medical schools in the basic medical sciences are comparatively unknown to undergraduate students. Even in biology less emphasis is now being placed on morphology. Medical students frequently do not know of the existence of combined M.D.-Ph.D. program, or even of academic opportunities in anatomy.

Anatomists must continue to rely on attracting graduate students from other sciences, even though a comparatively small percentage of these actually change fields. Zoology students were thought more likely than some others to change over to anatomy once they had been exposed to it. The problem was how to get them into the anatomy department in the first place. Summer sessions in anatomy were proposed as a practical means of orienting such students toward this field.

Recruit anatomists among medical students

In spite of the overriding tendency among medical students to enter medical practice rather than teaching, there are always some whose academic bent and inclination may lead them toward this profession in spite of the financial attractions of clinical medicine. That considerably more medical students may be inclined toward careers in anatomy than actually undertake them is suggested by replies to the questionnaire. Of 560 fourth-year medical students, 9 per cent reported that their contacts in anatomy had aroused interest in teaching and research in anatomy. Inspiring teachers are influential in effecting such a choice when made. Research fellowships are important in attracting and holding students in anatomy. Among the anatomists polled, a total of 14 per cent had done research or held fellowships immediately after completing graduate or medical studies (Table 6.4). The increasing number of fellowships available might help increase the number of anatomists. Actually, however, anatomy was not being favored particularly with numerous postdoctorate fellows. Only 11 of the 365 National Research Council's medical fellows are now in academic anatomy: 17 had their fellowship in anatomy.

Increase financial assistance

Encouraging medical students to take a year out of the regular curriculum for research was also mentioned as a means of switching student ambitions from practice to teaching. Additional funds to help students finance such a year were essential. More well-trained anatomists could also be secured via graduate work after completion of an M.D. if funds could be made available for such programs.

An increase in summer research and study programs was also recommended to attract more people into the field. Not only would they orient and introduce the beginner to the study of anatomy, but they could be used

TABLE 6.4

FIRST POSTDOCTORAL POSITIONS FOR ANATOMY STAFF MEMBERS

(Chairmen group)

First postdoctoral experience	Per cent of 520 faculty members*
Assistantship	1
Fellowship	7
Internship	10
Research	7
Residency	3
Teaching	37
Teaching and research	15
Medical practice	6
Practice and teaching	1
Practice and research	1
Advanced study	6
None, or present appointment	6

*Department chairmen representing 90 schools with a total faculty of 838 were asked to supply this information. The first postdoctoral experience of 7% was not specifically defined and for 8% the responses were unusable. There was no response on 22% of the faculty members.

to strengthen ties between the teachers and interested medical students who would be afforded opportunity for additional research.

Some financial assistance is available for graduate students. Of 72 departments responding to the questionnaire, 24 per cent stated that no financial aids were available for graduate work. Fellowships and scholarships were available in 62 per cent of the schools. Seventy-four per cent offered teaching assistantships and 65 per cent research assistantships (Table 6.5). Some schools offered multiple methods of supporting graduates.

TABLE 6.5

GRADUATE STUDENT FINANCIAL SUPPORT

(Chairmen group; Multiple response)

Support cited as available	Per cent of 72 departments*
No assistance	24
Fellowships or scholarships	62
Teaching assistantships	74
Research assistantships	65
Other	8

*No response = 20% of total N = 90.

Current recruitment efforts

In general, anatomists have not assumed much initiative in recruiting graduate students. Only 32 per cent of the chairmen queried on the questionnaire had made any effort to attract graduate students to the department. Most frequent recruiting technique (15 departments) consisted of sending out announcements of the program of study and of vacancies (teaching and research assistantships) (Table 6.6). There was some doubt as to the effectiveness of the announcements. Three departments reported visits to other schools to interest students.

More than one discussion group suggested that the American Association of Anatomists undertake a vigorous program designed to focus attention on career opportunities in this field, emphasize current research accomplishments, and in general provide those science students who form the potential

TABLE 6.6

RECRUITMENT OF GRADUATE STUDENTS
(Chairmen group; Multiple response)

Items cited on student recruitment	Frequency
1. *Nature of recruitment efforts*	
Announcements of the program of study and of vacancies are circulated	15
Students are interested by financial aid and teaching positions	6
Other schools are visited in order to interest students	3
Students are acquired from medical school	3
An active student research society has been established	1
A combined Ph.D.—M.D. program is offered	1
2. *Factors hindering recruitment*	
Limited space, time, facilities allow for only a few graduate students	10
Not enough funds are available with which to make special efforts	5
Students withdraw for medical school	4
There is a lack of interest in anatomy	3
Confusion of expansion caused the dropping of graduate program	1
Most students are poorly prepared for graduate work	1
Recruiting can become a burden	1
3. *Statements of present practice*	
Do not have a graduate program	3
No special attempt is made to recruit new students	3
Have adequate number of applicants	2
New graduate program	2
Applicants were considered but none were accepted	1
It is not policy to use students as teachers	1
New school	1
Only recently received ample funds for support	1
Students are carefully selected	1
Students with a medical education are preferred	1
Too little effort has been made for recruiting new students	1
Other	2
No response	27
(Total N = 90)	

reservoir of future anatomists a better idea of precisely what is meant by this profession. Plans for such a program lost some appeal when it was pointed out that 100 well-trained anatomists would more than fill all budgeted academic vacancies in anatomy.

The number of advanced degrees in the anatomical sciences given in 1951-55 amounted to 198 M.A.'s or M.S.'s, whereas in 1931-35, 88 such degrees had been awarded (on the basis of 90 departments reporting). Ph.D.'s awarded during the same period increased from 30 to 136 (Table 6.7). The number of students getting Ph.D.'s in anatomy has increased from 54 to 136 within the last five years alone. Furthermore, 120 students majoring in other sciences took minors in anatomy in 1951-55.

Such figures indicated that the anatomists were actively recruiting future anatomists through their own programs. But, although more than tripled in the last 10 years, graduate programs in anatomy had been unable to compensate for attrition, needs of new schools and of research laboratories. In spite of the increased numbers of graduate students completing work in anatomy, among 71 schools reporting, 27 budgeted vacancies existed for graduate students (see Table 1.5).

Anatomists also go elsewhere

Anatomists should keep in mind their responsibility for preparing students to work in other fields. "Our functions as teachers of research methods should transcend the specific training of anatomists. The training given in anatomy should be broad enough so that graduate students are equipped to obtain positions elsewhere than in anatomy departments." A fairly high number of graduate students, after receiving degrees, transfer to medical school or accept research fellowships (Table 6.8).

TABLE 6.7

CANDIDATES RECEIVING DEGREES IN FIVE PERIODS SINCE 1930
(Chairmen group)

Number of candidates	Number of departments														
	1931-35			1936-40			1941-45			1946-50			1951-55		
	T*	P*	Tot.	T	P	Tot.	T	P	Tot.	T	P	Tot.	T	P	Tot.
							M.A. or M.S. degree†								
0	8	4	12	8	4	12	9	6	15	7	4	11	4	1	5
1	1	1	2	3	1	4	3	2	5	7	1	8	3	4	7
2	1	1	2	2	1	3	1	1	2	4	3	7	5	7	12
3 - 5	3	1	4	5	3	8	4	1	5	5	5	10	12	6	18
6 - 10	2	0	2	2	0	2	2	0	2	3	0	3	5	2	7
11 - 15	1	0	1	2	0	2	1	0	1	2	0	2	4	0	4
16 - 20	2	0	2	1	0	1	0	0	0	1	0	1	0	0	0
N of schools	38	27	65	38	27	65	38	27	65	38	27	65	38	27	65
No response	20	20	40	15	18	33	18	17	35	9	14	23	5	7	12
Total no. degrees	82	6	88	81	15	96	47	7	54	103	23	126	143	55	198
							Ph.D. degree‡								
0	7	4	11	7	4	11	11	5	16	9	3	12	4	2	6
1	4	5	9	6	6	12	1	2	3	6	3	9	8	6	14
2	1	1	2	2	0	2	2	0	2	0	3	3	1	3	4
3 - 5	1	0	1	1	2	3	1	5	6	4	5	9	8	7	15
6 - 10	2	0	2	1	0	1	0	0	0	1	0	1	3	3	6
11 - 15	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
N of schools	33	28	61	33	28	61	33	28	61	33	28	61	33	28	61
No response	18	18	36	16	16	32	17	16	33	13	14	27	8	7	15
Total no. degrees	23	7	30	24	14	38	20	23	43	26	28	54	74	62	136
							Minor in anatomy‖								
0	6	3	9	5	3	8	5	3	8	4	2	6	3	2	5
1	1	0	1	2	1	3	1	1	2	0	1	1	1	1	2
2	0	1	1	0	1	1	0	2	2	2	1	3	1	1	2
3 - 5	1	1	2	1	2	3	0	2	2	2	2	4	7	4	11
6 - 10	1	0	1	1	0	1	2	0	2	2	2	4	2	3	5
11 - 15	0	0	0	0	0	0	0	0	0	1	0	1	3	0	3
N of schools	39	33	72	39	33	72	39	33	72	39	33	72	39	33	72
No response	30	28	58	30	26	56	31	25	56	28	25	53	22	22	44
Total no. degrees	10	5	15	14	10	24	16	12	28	37	23	60	75	45	120

*Column headings: T = Tax supported schools
P = Privately supported schools

†Of 90 departments reporting, 63 now offer training toward the M.A. or M.S. degree. One additional department withdrew from participation in graduate training after 1930, and another has granted no additional degrees since the period 1931-35.

‡Of 90 departments reporting, 60 now offer training toward the Ph.D. degree. One additional department has granted no Ph.D. degree since the period 1931-35.

‖Of 90 schools reporting, 72 now offer graduate training leading to a minor in anatomy.

TABLE 6.8

POSITIONS USUALLY ASSUMED BY GRADUATE STUDENTS IMMEDIATELY AFTER RECEIVING DEGREE
(Chairmen group)

Type of position assumed by graduates	Per cent of schools reporting distribution of positions						Total N = 90	
	0% of students	1 - 20% of students	21 - 40% of students	41 - 60% of students	61 - 80% of students	81 - 100% of students	Responding N	% no response
Teaching position in own school	51	29	11	7	2	0	(45)	50
Teaching position in other departments of anatomy	35	18	13	7	11	16	(45)	50
Research fellowship	55	27	16	0	2	0	(44)	51
Transfer to medical school	35	29	9	9	7	11	(45)	50
Teaching in other disciplines	66	32	0	2	0	0	(44)	51
Other	57	7	12	5	7	12	(42)	53

Salaries

A primary assumption of all entering the teaching profession is of course that the charms of teaching compensate for lack of remuneration. Granted that anatomists have foresworn the monetary attractions of medical practice, they are nonetheless frequently burdened beyond normal expectation by financial pressures. Clinical teaching brings better returns than does preclinical. Many schools have no regular rate of salary increase for their faculty, and increases are given only under pressure of necessity to match a salary offered by another school anxious to procure a professor's services.

Anatomists as a rule teach more hours than members of other preclinical departments, at less cost per hour to the university (see Table 1.4). The heavy teaching responsibilities limit the opportunities for research, thus placing anatomy at some disadvantage in retaining able and ambitious young teachers.

Inevitably, the low salary levels prevailing in this teaching profession prevent many promising young medical scientists from entering it. With a prospect of more equitable financial return, more recruits would be attracted. The suggestion was made that medical schools should be encouraged to continually reappraise salary scales in the basic sciences.

Training of graduate students

Graduate students should get some experience in teaching. Although usually serving as laboratory assistants or preparateurs (Table 6.9), they also lecture in some courses, not only in medical but other undergraduate courses as well. Chairmen regard the opportunity to teach as primarily for the students' own benefit, to afford them needed experience. Seventeen per cent of departments used graduate students for teaching because of inadequate staff (Table 6.10). Overloading teaching assistants to the point where their studies or researches are impaired, or with repetitious and unstimulating assignments, should be avoided.

Courses of study followed by graduate students vary. In 82 per cent of the departments queried graduate students are required to take all of the basic

TABLE 6.9

TEACHING ASSISTANCE BY GRADUATE STUDENTS
(Chairmen group; Multiple response)

Type of assistance	% of 71 responding depts.*
Lecture	38
Conduct conferences	31
Laboratory assistants	86
Laboratory supervisors	25
Preparation of laboratory materials	63
Other	13

*No response = 21% of total N = 90.

TABLE 6.10

PURPOSE OF TEACHING ASSISTANCE BY GRADUATE STUDENTS
(Chairmen group; Multiple response)

Purpose of using graduate students	% of 70 responding depts.*
As teachers only because of inadequate number of teachers	17
As teachers primarily for their own experience	83
For instructing classes of medical students	71
Primarily for instruction of other groups:	
Art students	3
Dental students	10
Nurses	21
Optometry majors	1
Physical education majors	10
Physiotherapists	10
Technologists	7
Unspecified	4

*No response = 22% of total N = 90.

courses in anatomy. About half the departments required them to take basic courses in physiology, biochemistry and pathology as well. Approximately half the departments encourage students to elect work in anatomy as well as in the other three disciplines mentioned. A few schools encourage students to follow the first two years of the medical curriculum. Not infrequently allowance is made for the type of research activitiy anticipated. The breadth of experience attained by graduates of different schools differ widely. But in general they are prepared to begin teaching all aspects of human morphology as well as to continue productive research in experimental or descriptive morphology. Above all, the schedule should provide adequate time for experience in original research.

Training of young anatomy teachers

Training opportunities for young anatomy teachers, once they are launched on this career, were also discussed. Many schools assign younger staff members to do most of the laboratory teaching. Departments were warned against overloading new staff members with teaching in ancillary courses such as those given to physiotherapists, technicians, etc., as being unchallenging and monopolizing time that might better be spent on research.

Devoting a good portion of time to research was generally considered a necessary part of the developmental experience of younger faculty members. In the words of one participant: "In medical school teaching and research are inseparable; and there is no life in medical teaching when the spirit of inquiry departs from it." While the capacity to do research does not guarantee the effectiveness of a teacher, a lack of it or a lack of time for it will eventually diminish his effectiveness.

The suggestion was made that, in cases where poor facilities for research existed at an institution, a promising new faculty member should be sent where such facilities can be provided. The small loss of time and service would be of little consequence in comparison to the inculcation of a good scientific background. Development of a man is of infinitely greater importance than the production of a piece of research in a particular laboratory. The developing investigator should be in an environment where quality of research is regarded as of primary importance, whether quantity is large or small.

Special training sessions

As a means of increasing the educational experiences of new recruits, it was proposed that teacher training programs be inaugurated. A summer program might be conducted by qualified teachers at various universities or medical schools during sucessive summers, open to prospective or active younger teachers of anatomy. Courses would include the subject matter of the several divisions of anatomy, and discussion of methods of teaching. These summer teaching seminars would be conducted by experienced anatomists rather than by experts in education, although the latter might be invited to participate.

Financial backing for such institutes might be procured from interested foundations, contributions from schools in the form of tuition and board for

their young instructors, or an arrangement for state subsidy such as the Southern Regional Education Program employs.

Care would have to be taken in selecting the faculty of such summer schools, and the most experienced anatomists should be utilized. Location of such an institute would depend on adequacy of the available teaching material, library facilities, pleasant environment and the accessibility of proper consultants.

Cooperation of clinical departments encouraged

Some consideration was given the problem posed by the establishment of basic research programs in clinical departments. This was thought to have deterred a number of individuals with research abilities from entering anatomy and other basic sciences. The direct affiliation of basic science departments in such programs should be encouraged, with the basic aspects of the program undertaken not in the clinical but in the basic science department.

Discussants at the Institute suggested that more clinicians might be encouraged to advise selected individuals to spend a year on a research fellowship in anatomy. Even if only a few recruits in the field of anatomical research and teaching were gained, the background of those continuing in clinical work would be enriched. The point was made that "if anatomists had even part of the privilege of clinicians, in having a continuous stream of interns and residents pass through their hands who spend their years in special fields at no cost to the department, there would be no shortage of teachers of anatomy."

Anatomy is taught not only by professional anatomists, but is a necessary part of teaching in practically every other course, both in basic sciences and clinical fields. The integration of anatomy and other basic sciences with clinical teaching is as desirable as bringing clinical correlations to the basic sciences. In the words of one discussant: "The responsibility of teachers at all levels is interpretation so that the student, who is primarily responsible for his own mental processes, can integrate his experience. Perhaps in our deliberations too much attention has been given to the easier mechanical integration of curricula and too little to the more difficult personal mental process of the integrative action of the nervous system."

It was agreed that the ideal training for an anatomist is graduate work in all aspects of human biology. Different ways of implementing this should be available also from the clinical departments and from the departments of pathology. The point was frequently made that anatomists with Ph.D.'s should exert special effort to acquaint themselves with clinical problems.

The hope was also expressed that anatomists might extend their teaching into the later medical school years. This might eventually help attract more recruits into the anatomy departments. As it is, medical students come in contact with the clinician last, and his influence has greater impact. (For further discussion of this, see Chapter VII.)

VII

Teaching Opportunities and Responsibilities in Postgraduate and Clinical Years

At no time does one concentrate so thoroughly on the available data as when endeavoring to attain the solution of an absorbing problem, and at no time does one take cognizance of the pertinent facts as when equipping oneself to meet a definite situation.
A. D. BUSH, 1926

THE TEACHING OF anatomy during the upper-class years depends in part upon the comprehensiveness of the basic courses usually given during the first year. When these courses are short and the amount of detail presented is abridged, a relatively greater need exists for additional formal instruction during the upper-class years. The current tendency to reduce the time afforded anatomy during the first and second years augments the need of additional instruction at the later periods and at times when the backgrounds and viewpoints of the students have changed. Even without additional reduction of content of basic anatomy courses, the problems of correlating anatomy with clinical teaching exist. The role of the anatomists in teaching the morphological aspects of applied medicine has not been as standardized as their role in basic anatomical teaching has become (see Chapter I). The changes with scientific advances alter the relative practical value of special aspects of human morphology with successive years and to a greater extent these changes must be first reflected in upper-class instruction and thus augment the need of special postgraduate courses.

The anatomist almost always finds it impossible to present in one basic course all that his clinical associates in the several specialties would recommend.

Increasing constrictions on curriculum

Several converging pressures threaten the traditional position of the basic anatomical sciences. Competition from new subject matter injected into the curriculum may infringe additionally on time allotted anatomy. Objections continue to be voiced against the amount of detail emphasized in freshman anatomy, and the occasional neglect of clinical applications. There was considerable agreement that details were presented in too concentrated a period when all of anatomy was covered in four months, as in the block system (see Chapter IV). The subject admittedly was encyclopaedic. No single solution could be reached as to what might be eliminated.

Proposals for curriculum revision

There were, however, speculations as to how freshman anatomy might be revised. Gross anatomy, for instance, for first-year students might consist of only a general survey of the body, with accent on certain areas such as the thorax, abdomen and pelvis. In such a case, other areas would be skimmed over lightly but included. A more detailed dissection of the extremities might be made in connection with orthopedics, or study of the eye or ear in conjunction with third-year courses in ophthalmology and otology.

Many objections were voiced to such a proposal. From a practical standpoint, the cadaver problem would be magnified rather than alleviated. Additional laboratory space for setting up and storing many cadavers, slide-sets and other materials would be required. Students would be deprived of proper groundwork for basic courses in physiology and pathology unless the scheduling of these courses was also modified. Unilateral adjustments of any significant extent could not be made effectively.

If the study of the whole man in his total environment is the goal of medical education, then anatomy should survey the structure of the whole body and this survey seemed best during the first year. Some comprehension of the total body is necessary to integrate functionally the separate organ systems that serve special purposes but are closely interrelated to one another. A program oriented toward integration should not commence by fragmentation. The integration of different structural units of the body was not considered less undesirable than the integration of structure and function.

Deferring dissection of certain body regions until these regions or organs were taken up in clinical specialties was also opposed on the same basis posed in objection to the concept of disease-by-organs. As one participant stated: "This concept is faulty and its only value lies in expedience. Pneumonia is not simply a disease of the pulmonary system or lung, for many processes are involved—such as white cell mobilization and fever—in an interrelated attempt to overcome the infection by many regions of the body whose activity is not integrated by the lung." The specific anatomy of the specialty must be reviewed or elaborated in context with the specialty. An adequate basic comprehension would shorten the period of orientation. The educational value of some repetition of detail in a new context was discussed.

Objections were also raised against suggestions which proposed to make anatomy merely an introductory survey of the body, affording a superficial concept of the body's composition as a collection of organ systems, each devoted to a major function but closely interrelated to one another and with their activities integrated by the nervous and endocrine systems. Under such circumstances the body would be visualized as a number of separated parts performing integrated functions. In one course at least the body should be considered to be a compact structural unit arranged to permit separate but integrated function. "If the goal of the educational process is making a synthesis from analysis, the introductory survey plan, with subsequent detailed study of parts in later years of the curriculum,

proceeds backwards. It starts with synthesis and then proceeds to analysis."

No easy solution

There is no easy solution to the problem of mastering too much detail in a limited period of time which is inherent in anatomy. Neither the omission of regions for later study nor the dictation of general principles without their formulation from real experience were answers. In the words of one teacher: "The subjects cannot be simplified. They can only be abridged or amputated, and anatomists must decide where the abridgement is to take place." To the majority the only feasible solution seemd to be allocation of adequate curricular time to basic anatomy. Most participants appeared satisfied with such time as was already held, but felt that no more retrenchment should be tolerated. The average current allotments for the anatomical sciences were 337 hours for gross anatomy, 153 for histology, 96 for neuroanatomy and neurology, and 57 for embryology. Combined anatomy courses average around 660 hours, and range from 562 to 825 hours. The great range in hours devoted to the several courses in different schools (see Table A.1, Figures 1, 2) implies a possibility of some adjustment somewhere in the curricula of many schools.

Many participants, however, felt that anatomists might as well adjust to the fact that, undesirable as it might be to reduce the time spent in anatomy during the first year, further reduction in many schools seemed inevitable.

Anatomical education in clinical years

Even if basic anatomy is not to be modified, nor regions of the body dissected and mastered later in the curriculum, there remains the question of additional anatomy courses in the clinical years.

Courses offered

Few anatomy courses are given for upper-class students in medical schools throughout the country. Only 13 schools reported in the questionnaire that they scheduled required courses in the third year; only 9 schools, of those replying, scheduled any in the fourth (Table 7.1). Subjects covered included: surface anatomy, anatomy of special senses, surgical anatomy, clinical applications of anatomy, radiologic anatomy, teratology, endocrine histology, cross-sectional anatomy and applied neuroanatomy.

Amount of time allotted such courses varied. Required courses in the third year ranged in hours from 10 to 118, with an average of 40 hours; required courses in the fourth year averaged only 23 hours. Five departments offered elective courses for third-year students (average of 35 hours) and only one department offered an elective course (24 hours) in the fourth year. Additional research courses or special regional dissections are available in either year in a few departments.

Courses favored by students, graduates

It appears that at least a third and probably more of the fourth-year students polled received additional instruction during the upper years, often

TABLE 7.1

ACTUAL AND PREFERRED ANATOMY INSTRUCTION FOR THIRD AND FOURTH YEAR MEDICAL STUDENTS
(Chairmen group)

Course	Total clock hours			Number citing courses given with hours unspecified
	Range	Mean	N*	
			Actual instruction	
Third year				
Required including: Anatomy III, anatomy of the ear, anatomy of the eye, applied anatomy, biochemistry, gross anatomy, neuroanatomy, medicine, regional and topological anatomy, and surgical anatomy	10 - 118	40	(12)	1
Elective including: Applied anatomy and surgical anatomy	23 - 72	35	(5)	0
Fourth year				
Required including: Anatomy II, applied anatomy, basic medical science, clinical anatomy, science conference and surgical anatomy	4 - 32	23	(8)	1
Elective including: Applied anatomy, embryology, gross anatomy, kinesiology, neuroanatomy and microscopic anatomy	24	24	(1)	5
Third and fourth year				
Required including: Research and surgical anatomy	14 - 48	31	(2)	0
Elective including: Bioclinical seminar, dissection, and research	48 - 90	76	(3)	1
			Preferred instruction	
Third year				
Required including: Applied anatomy, gross review, medical genetics, and neuroanatomy	10 - 100	50	(4)	0
Elective including: Anatomy of the newborn, applied anatomy, brain modeling, development of the heart, embryology, embryology and genetics, endocrinology, gross anatomy, history of medicine, physical anthropology, special problems, tissue culture, and topological anatomy	16 - 120	53	(11)	2
Fourth year				
Required including: Applied basic science, surgical anatomy, and symposium	30 - 48	37	(3)	0
Elective including: Applied anatomy, gross anatomy review, history of medicine, genetics, and surgical anatomy	10 - 48	25	(6)	0
Third and fourth year				
Required including: Applied anatomy, surgical anatomy and x-ray anatomy	20 - 30	28	(4)	0
Elective including: Applied anatomy, cytology, embryology—advanced, fetal anatomy, histochemistry and cytochemistry, histology—advanced, neuroanatomy—advanced, regional gross anatomy, and surgical and cross-sectional anatomy	30 - 128	72	(9)	1

*Number of chairmen citing item; total N = 90.

in conjunction with specialized courses (Table 7.2). They emphasized a need for increased availability of instruction in clinical applications of anatomy, surgical anatomy and applied neuroanatomy (Table 7.3). Next were listed surface anatomy, anatomy of the newborn infant and child, radiologic anatomy and regional anatomy. The fourth-year students seemed least interested in anatomy of old age, constitutional anatomy, anatomy of the special senses, endocrine histology, cytology, human genetics, physical anthropology and cross-sectional anatomy. The majority saw no need for drastic revision of basic anatomical training (Table 7.4). Less than a third of them would have liked more experience in neuroanatomy, embryology, gross anatomy, in that order.

Graduates of medical schools (group described in Tables A.24 and A.25) also reported on their opportunities for advanced training in anatomy. Advanced courses in gross anatomy had been available during their third and fourth years in medical school to 49 per cent of the graduates—to 21 per cent as required courses, to 23 per cent as electives. Courses in histology were available to 14 per cent, in embryology to 9 per cent, in neuroanatomy to 23 per cent. A third of the graduates reporting had taken advantage of courses in gross anatomy, but very few had availed themselves of opportunities for further work in histology, embryology and neuroanatomy (Table 7.5).

TABLE 7.2

STUDENT OPINION ON ADVANCED ANATOMY COURSES
(Student group)

Comment	Frequency of response cited by 480 4th yr. students*
1. *Comments indicating that instruction was received or that the reaction to instruction was favorable*	
Had review of surgical anatomy in clinical years	134
Anatomy was reviewed in specialized courses	43
Elective courses in anatomy were deferred in the clinical years	33
Instruction was adequate	15
The courses taken were worthwhile	14
Had review of anatomy in the clinical years	9
Had required anatomy course in clinical years	4
2. *Comments indicating a lack of instruction or suggestions for improvement of instruction*	
Had little or no anatomy in the clinical years	90
The courses taken were insufficient	68
Anatomy instruction needs clinical correlation	66
A review in anatomy is needed	42
More detailed study is needed	7
Other comments	25

*Total N = 560.

TABLE 7.3

STUDENT OPINION ON AREAS OF ANATOMY INSTRUCTION PRECEDING CLINICAL YEARS
(Student group)

Area of instruction	% of 560 4th year students indicating amount of instruction received				No. of students indicating not offered but should be	Modification recommended*	
	Some	None	No response	Elective		N	Rating
Surface anatomy	89	7	4	1	32	(515)	2.5
Anatomy of the newborn, infant, and child	45	48	7	1	164	(400)	2.4
Anatomy of old age	29	63	8	0	119	(376)	1.4
Constitutional anatomy	45	35	20	0	48	(340)	1.1
Anatomy of special senses	92	1	7	2	5	(515)	1.0
Clinical applications of anatomy	89	5	6	1	31	(519)	4.0
Surgical anatomy	80	13	7	8	54	(498)	3.1
Radiologic anatomy	75	19	6	5	64	(472)	2.8
Abnormal embryology (teratology)	73	21	6	0	35	(480)	0.6
Endocrine histology	88	8	4	1	12	(517)	0.6
Cytology and cyto-chemistry	63	32	5	2	58	(456)	1.0
Human genetics	49	45	6	4	105	(428)	1.8
Physical anthropology	20	73	7	1	67	(376)	0.7
Cross-sectional anatomy	77	18	5	2	22	(490)	0.7
Applied neuroanatomy	91	4	5	3	12	(523)	3.0
Regional anatomy of specific parts or areas	65	2	33	1	6	(368)	2.5

*Ratings have been assigned to each course based on the number (N) of persons responding to this section of the question. A recommendation that more instruction should be given is scored "+5", no change is scored "0", and a recommendation for less instruction in the area is scored "−5". The average score for each area is given. Thus if all respondents recommended more instruction, the average score would be 5.0. Scores based on the larger numbers of respondents may be considered more stable and more representative of attitudes of fourth year students than those based on smaller numbers.

TABLE 7.4

STUDENT OPINION ON MODIFYING AMOUNT OF ANATOMY COURSE WORK AS PREPARATION FOR CLINICAL YEARS
(Student group)

Recommendation for change	% of 4th year students responding			
	Gross anatomy	His-tology	Neuro-anatomy	Embry-ology
More	24	9	31	30
Less	11	11	8	19
No change	65	80	61	51
Responding N	(554)	(547)	(553)	(548)
No response (per cent of total N = 560)	1	2	1	2

TABLE 7.5

AVAILABILITY OF ADVANCED ANATOMY COURSES IN THE THIRD AND FOURTH YEARS

(Graduates group)

Course	Graduates indicating they took course					Graduates indicating availability of course					
	% response			Total N =670		% response				Total N =670	
	Yes	No	Not avail.	Respond-ing N	% no re-sponse	Yes re-quired	Yes elec-tive	Yes unspec-ified	No	Respond-ing N	% no re-sponse
Gross anatomy	35	13	52	(650)	3	21	23	5	51	(657)	2
Histology	3	10	87	(583)	13	2	9	3	86	(587)	12
Embryology	1	8	91	(583)	13	1	5	3	91	(583)	13
Neuroanatomy	11	12	77	(597)	11	6	11	6	77	(599)	11

In general, more than half the graduates favored additional instruction in gross anatomy; a third recommended no change; very few suggested less. Opinions seemed to depend to some extent on the specialties of the practicing physicians (see Table A.22). About a fourth of the graduates retrospectively desired further advance instruction in embryology and histology; about half in neuroanatomy.

Presentation as part of clinical courses

Among fourth-year students reporting a desire for additional training, the majority preferred to have anatomical material presented as part of the clinical course to which it applied (Table 7.6). They stressed additional electives in anatomy in the clinical years, or an advanced required course in gross and neuroanatomy.

TABLE 7.6

STUDENT PREFERENCES FOR ADDITIONAL ANATOMY TRAINING

(Student group; Multiple response)

(*Question:* If you feel the need of additional information in anatomy, which would you have preferred?)

Item on anatomy training	% of 4th yr. students responding			
	Gross anatomy	Histology	Neuro-anatomy	Embryology
A more extensive preclinical (1st or 2nd year) course	19	21	26	40
An additional required course (or courses) in the clinical years	32	6	34	4
An additional elective course (or courses) in the clinical years	35	26	34	25
Further anatomical material presented as part of the clinical course to which it applies	60	50	46	39
More opportunity for individual study	19	16	14	19
Responding N	(428)	(155)	(396)	(236)
No response (per cent of total N =560)	24	72	29	58

TABLE 7.7

STUDENT PREFERENCES ON INSTRUCTORS OF ADVANCED COURSES

(Student group)

Course instructor preference	% of 4th year students responding			
	Gross anatomy	Histology	Neuro-anatomy	Embryology
Anatomist	18	44	7	42
Clinical specialist	35	24	50	28
Combination	47	32	43	30
Responding N	(536)	(440)	(521)	(448)
No response (per cent of total N =560)	4	21	7	20

TABLE 7.8

REASONS FOR LACK OF UPPERCLASS ANATOMY INSTRUCTION
(Chairmen group; Multiple response)

Reasons cited by schools with inadequate facilities*	% of 56 responding chairmen
Lack of qualified staff	75
Lack of cadavers	48
Lack of space	38
Lack of other teaching material	20
Other	16
(No response = 2% of total N = 57)	

*Out of 90 chairmen, 63% indicated their schools had inadequate facilities for advanced instruction, 34% reported adequate facilities, and 3% did not respond.

In courses involving substantial clinical correlations (gross and neuroanatomy) students preferred to be taught by clinical specialists or combinations of anatomists and clinicians. In courses with fewer obvious clinical correlations (histology and embryology) they frequently expressed a preference for being taught by anatomists (Table 7.7).

Departmental chairmen, in response to the questionnaire, described the participation of their departments in third- and fourth-year courses as consisting chiefly (72 per cent) of responding to calls for occasional lectures and demonstrations. Barely a quarter of them had formal recurring arrangements with the clinical departments. Forty per cent took part in conferences involving medical students. Most common reason cited (19 schools) for failure to participate further in third- and fourth-year teaching was not being invited to do so by the clinical departments. Insufficient staff (six schools) and a crowded curriculum (seven schools) were also mentioned frequently as reasons for no participation. Eleven departments preferred not to participate. On the other hand, more than half of the chairmen described their departments as lacking staff and facilities (cadavers, space) for undertaking additional instruction in upper-class anatomy (Table 7.8).

Proposed additional courses

Thirty-one new advanced courses in anatomy have been added to departmental curricula during the past five years. They reflect many of the new areas of interest in anatomy, including cancer biology, radiographic anatomy, hematology, histochemistry, and surgical anatomy.

One course in surgical anatomy was described at the Institute which evoked particular interest. The course, taught with unembalmed material, is given in conjunction with the staff of surgery. It is a complete anatomical review, given by anatomists, on those parts of the body selected by the surgeon for their practical importance. Electives in surgical anatomy were also recommended by the discussants, in which the upper-class students provided prosector specimens for demonstration to the first-year class and the resident surgical staff. It was thought that such use of material enhanced interest and encouraged well-prepared dissections.

Advanced courses dropped

Some advanced anatomy courses have been added to the curricula and then dropped. During the last five years, applied anatomy courses have been dropped by 10 departments, embryology by 4 departments, and various other courses by 16. Sixty-two schools during the same period had not dropped any. The questionnaire did not reveal how many had courses that could be dropped as few schools had elective or upper-class courses. Only 17 chairmen thought that anatomy courses should be offered to third-year students. An additional 14 thought they should be offered to third- and fourth-year students. (Table 7.1.)

TABLE 7.9

CLINICAL DEPARTMENTS AND ANATOMY TEACHING
(Chairmen group)

Question	% of 90 chairmen responding			
	Yes	No	Don't know	No response
Can instruction be given by clinical departments?	72	16	1	11
Should instruction be given by clinical departments?	41	30	6	23
Are courses now given by clinical departments?	59	20	9	12

Role of clinical departments in teaching anatomy

No great concern was evinced by department chairmen over the minor role their departments played in instructing students during the clinical years (Table 7.9). Seventy-two per cent were satisfied that adequate anatomical instruction at this point could be given by the clinical departments, but only 41 per cent thought such instruction should be given by clinicians. Even when the latter were equipped to teach these subjects, there were some anatomists who preferred to see them taught by their own colleagues.

The majority of participants at the Institute thought that clinicians should be responsible for teaching such specialized anatomy as was applicable to their courses. They should be encouraged to call upon anatomists for help, but the teaching should be in their own domain. The presence of more or less lengthy reviews on anatomy in many of the textbooks on the clinical specialties indicates the need of additional instruction or review in context.

Some participants protested the above point of view and stressed the importance of extending the activities of the anatomy department into the later years.

It was thought particularly important in many instances that anatomists supervise training in applied anatomy. One teacher commented: "While frequently clinical chiefs are excellent anatomists in their own right, at other times their anatomical sophistication leaves much to be desired." The degree of supervision should vary accordingly.

Close cooperation urged

Many advantages would accrue from closer cooperation between departments. If anatomists would teach anatomy to the clinical resident staff,

the latter might be better qualified to teach the anatomy of their specialties to their students. Many reasons were cited in support of a closer relationship between anatomist and clinician. Today barriers between departments are breaking down; this foreshadows a future in which there will be increasing cooperation between specialists in both investigation and teaching.

Similarly the barrier between applied and pure science is disappearing, increasing the interest on the part of anatomists for clinical problems. At the same time, the clinicians have become more and more concerned with the basic medical sciences. New developments in histochemistry and the electron microscope have application for internists who must rely increasingly on the basic sciences of the laboratory.

Experience has shown that clinical demonstrations during the freshman year stimulate students, just as the medical graduate or upperclassman obtains more from consultation between clinical and anatomical specialists than from formal courses which particularize.

Inevitably, discussion came back to the importance of congenial cooperation between anatomist and clinician. Personal relationships would in the end be the deciding factor in establishing the kind of communication and give-and-take between departments through which the clinician would be able to make full use of the anatomist's contribution.

Such cooperation might even lend support to maintenance of adequate time for teaching basic anatomy. Clinical departments might endeavor to defend those segments that relate to their specialty. Interestingly, the head of one clinical department, it was stated, had offered to give up time in order to schedule upper-class anatomy courses.

Consultation responsibilities

Consultation services should be encouraged, but within limitations. Anatomists should not feel obligated to attend surgical operations, for instance, because surgery is not their teaching responsibility; the surgeon is familiar with the prerequisite anatomy. In certain specialized areas, however, the anatomist may make valuable contributions at surgical rounds. At one institution, an anatomist is invited by the cardiovascular study unit to the weekly conference on congenital heart disease.

There was little support for clinical-anatomical conferences, and little evidence that anatomists attended clinical-pathology conferences. This was deplored by some but excused by the fact that "clinicians do not make use of us when we attend." Others did not consider such activities particularly relevant.

In conclusion: while the anatomists expressed a general desire for some experimentation with anatomical instruction for the upper classes, many felt that additional teaching responsibilities in clinical years would overwork existing departmental manpower and facilities. They agreed that they should endeavor to be helpful to clinicians "as long as this does not interfere with primary duties."

TABLE 7.10

GRADUATE OPINION ON NEED FOR ADVANCED STUDY OF ANATOMY
(Graduates group)

Respondents' specialty field	% of graduates			N
	Yes	No	No response	
1. During residency or postdoctorate years did you feel the need for further anatomical studies?				
General practice	72	26	2	(97)
Obstetrics and gynecology	92	6	2	(54)
Otolaryngology	83	15	2	(59)
Pediatrics	61	37	2	(56)
Psychiatry	77	21	2	(62)
Radiology	87	11	2	(55)
Surgery	91	8	1	(217)
Urology	92	8	0	(52)
Others	61	39	0	(18)
Total	83	16	1	(670)
2. Do you still wish you had such further training?				
General practice	74	24	2	(97)
Obstetrics and gynecology	85	9	6	(54)
Otolaryngology	73	19	8	(59)
Pediatrics	61	34	5	(56)
Psychiatry	66	31	3	(62)
Radiology	71	20	9	(55)
Surgery	74	18	8	(217)
Urology	86	10	4	(52)
Others	55	39	6	(18)
Total	73	21	6	(670)

Anatomical education in the postdoctorate years

Need disclosed in questionnaire

An effort was made through the questionnaire to assess the demand for advanced anatomical instruction during the postdoctorate years by doctors engaged in general practice or in the specialties. (Types of courses currently offered to practitioners and specialists are shown in Table 7.15.) A high percentage of the graduates of the years 1940-50 responded affirmatively to the question, "Did you feel the need for further anatomical studies during residency or postgraduate years?" (Table 7.10.) Apparently only part of this lack has been made up through study and experience obtained during several years of clinical practice, because 73 per cent of the respondents stated they still wished that they had had more experience in anatomy.

The graduates were also asked to evaluate the effectiveness of different instructional methods. Their strongest recommendations were for material and the opportunity for independent study (84 per cent) (see Table A.23). Supervised dissection, study of slides and other laboratory procedures were

TABLE 7.11

RECOMMENDATIONS OF GRADUATES ON INSTRUCTORS OF POSTGRADUATE ANATOMY
(Graduates group)

Respondents' specialty field	% of respondents recommending three types of instructors			Responding N	No response (% of total N = 670)
	Anatomists	Clinicians	Combination		
General practice	1	23	76	(96)	1
Obstetrics and gynecology	2	6	92	(54)	0
Otolaryngology	2	7	91	(58)	2
Pediatrics	9	9	82	(55)	2
Psychiatry	6	12	82	(61)	2
Radiology	13	9	78	(55)	0
Surgery	7	12	81	(215)	1
Urology	4	6	90	(52)	0
Others	5	6	89	(18)	0
Total	6	11	83	(664)	1

TABLE 7.12

RELATIVE EFFECTIVENESS OF DIDACTIC TECHNIQUES AT THE RESIDENCY OR POSTDOCTORAL LEVEL

(Graduates group)

Respondents' specialty field	Total N for each specialty	Respondent rating of effectiveness of 5 methods*									
		Lecture		Film		Dissection		Demonstration		Seminar & conference	
		Mean rating	Responding N	Mean rating	Responding N	Mean rating	Responding N	Mean rating	Responding N	Mean rating	Responding N
General practice	97	3.1	(81)	3.8	(85)	5.3	(88)	4.9	(93)	3.9	(82)
Obstetrics and gynecology	54	3.2	(44)	3.4	(45)	5.4	(53)	4.6	(51)	3.8	(48)
Otolaryngology	59	3.4	(50)	3.4	(51)	5.4	(57)	4.7	(56)	3.6	(53)
Pediatrics	56	3.0	(40)	3.7	(42)	4.4	(42)	4.9	(48)	4.7	(46)
Psychiatry	62	3.2	(49)	3.1	(46)	5.0	(55)	4.8	(56)	4.6	(55)
Radiology	55	3.3	(40)	3.7	(47)	4.6	(45)	5.0	(53)	4.6	(47)
Surgery	217	3.2	(170)	3.5	(172)	5.6	(213)	4.7	(197)	3.9	(173)
Urology	52	3.1	(43)	3.5	(43)	5.6	(47)	4.8	(49)	4.0	(43)
Others	18	2.9	(13)	3.9	(15)	4.7	(15)	4.5	(15)	4.9	(16)
TOTAL	670	3.2	(530)	3.6	(546)	5.3	(615)	4.8	(619)	4.1	(563)

*Effectiveness ratings range from 1 to 6, with 6 indicating greatest effectiveness and 1 indicating least effectiveness. Means are based on responding N for each specialty group.

TABLE 7.13

ANATOMY TEACHING OF RESIDENTS IN SPECIALTY TRAINING

(Chairmen group)

Teaching method followed	% of 62 schools teaching residents*		
	Yes	No	No response
Give a series of regular lectures	42	44	14
Hold a series of regular conferences	32	36	32
Offer materials for study, e.g. undissected bodies or review parts, bone collections, slides, museum specimens, models, etc.	95	0	5
One of the regular staff is present or readily available for laboratory instruction of residents	86	11	3

*Out of 90 department chairmen, 69% indicated their schools taught anatomy to residents in specialty training; 30% said they did not, and 1% did not respond.

favored by 71 per cent. Organized courses in anatomy elicited least interest of all, although even these were endorsed by 63 per cent. The graduates favored instruction by a combination of anatomical and clinical teachers (Table 7.11). The young doctors' evaluation of the relative effectiveness of the different didactic procedures were surprisingly consistent, irrespective of their specialties. Dissecting, demonstrations, conferences and seminars received the highest evaluation as teaching procedures (Table 7.12). Many respondents actually favored combinations of two or more of the above methods. Lectures were least favorably regarded, a point that might have some significant implications both with respect to the previous experience of the respondents and in the organization of future postdoctorate courses by anatomists.

Courses available

Organized courses for interns are offered by only 20 per cent of the anatomy departments in medical schools throughout the country, supporting the assumption that hospital responsibilities leave the intern little time for study of basic sciences. In contrast, 69 per cent of the departments teach residents. Half of these offer instruction through a series of regular lectures; the others rely mainly on making available bodies for dissection, review parts, bone collections, slides and museum preparations (Table 7.13).

A moderate increase in interest in postgraduate courses was noted by a number of departments during the past five years. Of the specialists taking advantage of opportunities for resident training in anatomy, those practicing general surgery headed the list; the surgical specialties followed. In general, little instruction is given for pathologists, pediatricians, internists and urologists (Table 7.14).

TABLE 7.14

METHODS OF ANATOMY INSTRUCTION FOR SPECIALTIES
(Chairmen group)

Specialty field	Of 61 anatomy depts. teaching 1 or more specialty field*			% of depts. using 4 methods (of those teaching each field) (multiple response)			
	Do not teach this %	Do teach this %	Number	Demonstration	Lecture	Conference	Material
Pathology	89	11	(7)	29	14	29	100
General surgery	12	88	(54)	39	37	43	83
Otolaryngology	41	59	(36)	36	31	44	81
Orthopedics	36	64	(39)	28	23	41	92
Ophthalmology	56	44	(27)	33	33	22	81
Neurology and psychiatry	46	54	(33)	36	48	54	85
Urology	67	33	(20)	30	25	55	90
Obstetrics and gynecology	48	52	(32)	31	31	50	78
Neurosurgery	57	43	(26)	35	38	46	81
Pediatrics	85	15	(9)	11	22	56	56
Medicine	87	13	(8)	25	38	75	62
Others	84	16	(10)	70	60	50	60

*See footnote to Table 7.13; one of the 62 departments did not supply information.

Subjects needing emphasis

The graduates of the years 1940-50 expressed the greatest interest in increased instruction in gross anatomy during the residency years. Neuroanatomy ranked second. However, mention was also made of the need in pathology for further training in histology and embryology, little of which is currently available anywhere (Table 7.15). While there is less demand

TABLE 7.15

COURSES OFFERED TO PRACTITIONERS AND SPECIALISTS
(Chairmen group; Multiple response)

Type of course offered		Of 46 depts. offering such instruction*	
		%	N
Separate courses in the anatomy department		54	(25)
	(% *of 25 depts.*)		
Gross anatomy	100		
Histology	28		
Neuroanatomy	64		
Embryology	32		
Other	20		
Participation in clinical postgraduate courses		56	(26)
No response		4	(2)

*Out of 90 department chairmen, this 51% indicated they gave postdoctoral instruction beyond the house-staff level; 47% said they did not, and 2% did not respond.

for postgraduate courses in microscopic anatomy, it was urged that this too be offered wherever needed.

With regard to the organization of anatomy departments, the deans expressed little desire for separate faculties for graduate teaching. Over 90 per cent favored instruction by the same faculty for graduate and undergraduate groups; only one of the 78 deans reported separate faculties and only two preferred separate faculties.

Implementing postgraduate teaching

The anatomists at the Institute were alert to the importance of teaching their discipline in postgraduate years. The demand for such education will probably increase and must be met. The anatomists, to a considerable extent, hold a monopoly on anatomical teaching material and must assume the concomitant responsibility. Every effort should be made to obtain the staff, wherever necessary, and adequate equipment for this expanding role.

The motivation of the resident is high. He is seeking information and skills in an area of his greatest interest. Teaching such groups is often especially rewarding and calls forth the highest faculties and talent of the instructors. Instruction by full-time anatomists was usually preferred at this level; basic anatomy rather than clinical applications were the most useful supplement to the residents' practical responsibilities. "At the residence level, the need is for more basic, not applied, anatomy." It was suggested, however, by some discussants that courses be given in conjunction with clinical departments.

If time permits, residents are welcomed in the freshman anatomy courses as teachers, provided that their competence has been assured. Careful selection of resident teachers in first-year anatomy should be practiced. When sufficient anatomy staff members are unavailable, residents have been and can be used to assist in basic instruction (Table 7.16). In one situation described, a resident who dissected in the morning assisted in the regular freshman course in the afternoon, and taught his fellow residents in the evening what he had learned during the day.

Residents are frequently assigned to the department of anatomy (53 per cent of 90 departments) for a specified period of study. The anatomists

TABLE 7.16

RESIDENTS AS TEACHING ASSISTANTS
(Chairmen group)

Ratio of residents to staff members in depts. using residents as teachers*	% of 34 responding depts.
1 to 1	12
1 to 2	12
1 to 3	14
1 to 4	23
1 to 5	3
1 to 6	6
1 to 7	6
1 to 8	6
1 to 9	12
1 to 10 (or more)	6
(No response = 21% of total N = 43)	

*Out of 90 department chairmen, 48% indicated they used staff residents as teaching assistants in medical courses; 37% said they did not; 11% gave qualified answers; 4% did not respond.

endorsed the idea of their training being full-time rather than mixed with clinical duties, because of the almost insuperable difficulties in combining the two activities. In their association with the anatomy departments, they proved more successful as teaching assistants (93 per cent of 43 departmental chairmen considered their service valuable) less effective as research assistants (29 per cent favorable responses).

Residents should be encouraged to attend courses by being given free time from the hospital for this purpose. They should not be expected to work them in as extracurricular activities that interfere with night hospital work or family life. Likewise, postgraduate instruction should not be assumed as an added or extracurricular duty of the anatomists. Resident training courses are best taught by anatomists well schooled in basic anatomy but sympathetic to clinical problems and aware of clinical applications. Anatomically oriented clinical teachers functioned in this capacity in some schools. Some schools provide material for study only; the policy is one of self-education. Although self-education at this stage may be ideal, the supervision by a clinically oriented anatomist can usually make the period of study more rewarding.

Scheduling and credits

Most faculty members at the Institute favored placing the anatomy course in the middle of the resident years. The first year is one of orientation to the requirements of residency; motivation to basic science study comes more easily in the second year.

The discussants did not encourage offering the M.S. or Ph.D. to residents, because of the limitation of time and opportunity to fulfill requirements. There were some, however, who had no objection to this increasing practice, should the aspirant be willing to fulfill all requirements.

Hospitals not affiliated with medical schools should not provide make shift instruction for their residents, if arrangements can be made for them to attend the nearest medical school. Some medical schools have established administrative units in postdoctorate education to formalize registration, crediting and support of the advanced program.

Financial and other types of support for such teaching programs are easier to obtain if the teaching takes the form of organized courses. However, there was little endorsement of the idea that anatomy departments should receive extra financial compensation for instructing residents. Assisting local physicians was another matter.

Courses should answer local needs

Courses for residents should be designed as carefully as those for first-year students, but should be arranged according to local needs and desires which vary widely in different schools. Basic medical courses are given with the idea that the student will learn how to use his textbooks and material by himself during his postgraduate training. Applied anatomy is essentially a correlation between anatomy and application, which the resident should have developed.

Aid in review sessions

There was a difference of opinion as to whether anatomists should be expected to help residents review for Medical Board examinations. Some thought this highly unethical. Others considered it a service responsibility to make study material available for such purposes, in spite of the fact it was a mild nuisance. Actual contact instruction was generally thought "beyond the call of duty."

Formal courses for physicians

Formal courses for physicians and surgeons were regarded as beyond the regular duties of basic science teachers and, when requested, justified compensation. A fee for such courses served the dual purpose of supporting the course and insuring more complete attention (and attendance) from the practitioner. Fifty-one per cent of the departments offered such courses. When such courses are arranged, the participants should be furnished material and facilities and should organize the course themselves. Such a plan had met with varying success, however. Dissection and demonstration were rated higher than films or lectures by the postdoctoral groups (Table 7.12).

Informal consultation

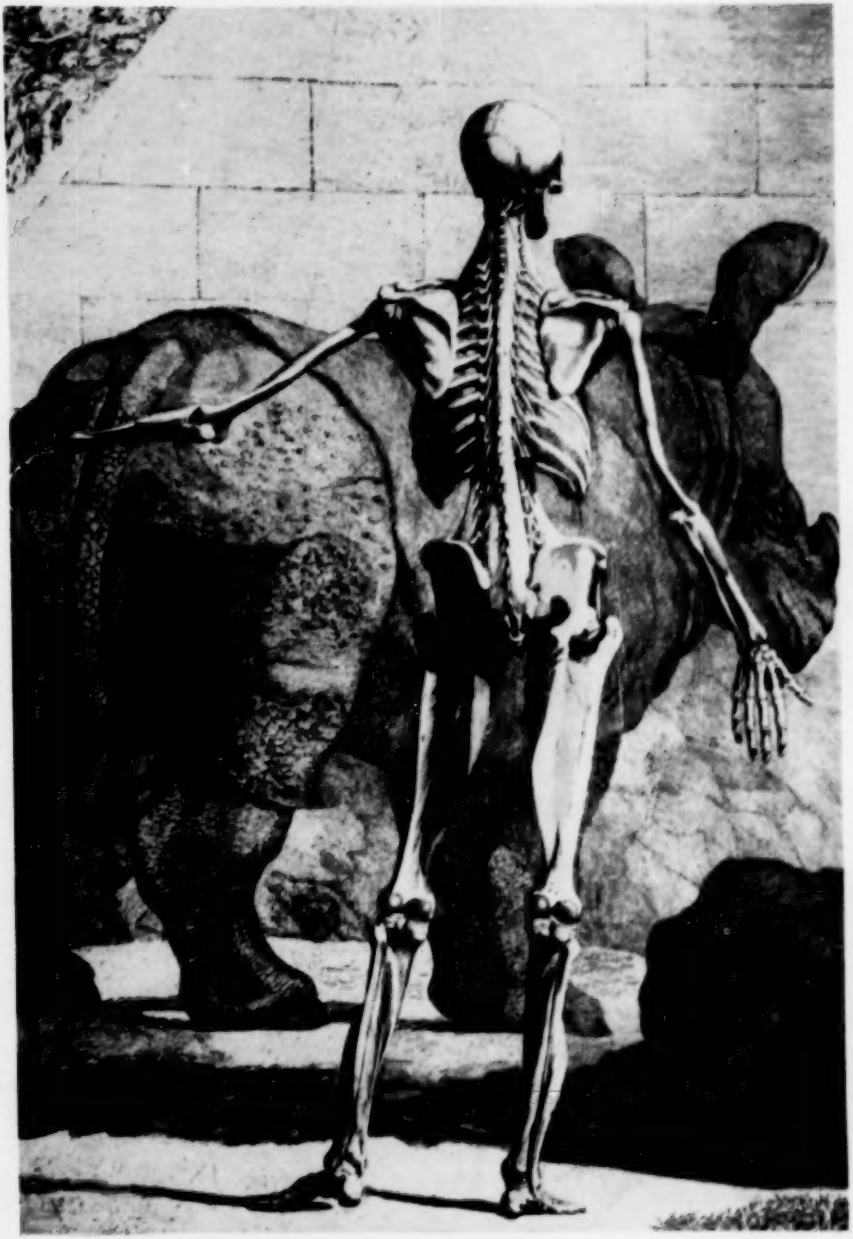
Many anatomists are called upon occasionally for informal consultation. Opinion varied as to how these requests should be met. Most anatomists felt that such requests fell within the scope of the anatomist's service, that they served as intellectual stimuli and sources of professional gratification. One participant stated that consultation without recompense had value in making him feel at home with his clinical colleagues, and brought more patients to him than he would otherwise see, with a resultant beneficial psychological effect on his students and all his teaching. Most anatomists consider responsibilities for patient care a distraction from basic and scientific activities.

No one anatomist has the knowledge or time to meet all demands likely to be made on him; he cannot accede to all requests. However, it should

be remembered that insofar as he makes himself useful, even indispensable, to his colleagues in other disciplines, the anatomist makes a contribution in good public relations, which will eventually redound to the advantage of his profession. Such cooperation may even bring in funds to augment the fluid research funds of the department, and open another avenue of usefulness for the anatomist in medical teaching.

Conclusion

In conclusion, it was generally agreed that in modern times barriers between departments are breaking down and we may look more and more to increasing cooperation between specialists in clinical work, investigation and teaching. Anatomy, as the repository for many techniques, may be expected to spread through the curriculum rather than to contract within it. Anatomists, being strongly motivated toward research, may be inclined to regard extension of their teaching beyond the basic courses as interference with their scholarly pursuits. Such extensions, however, enlarge their interests and broaden the scope of their research. As many participants underscored at the Institute: Time for scholarly activities must be maintained by enlarging staffs, not by a shrinkage of interest and denial of opportunities.



APPENDIX A

The Teaching Institute

The sessions of the Teaching Institute on Anatomy and Anthropology covered four days, from Tuesday, October 18, through Saturday noon, October 22.

As at former Institutes, the participants were invited by the Association of American Medical Colleges and with the approval of the administrators of their respective schools. Anatomy departments from all of the medical schools of Canada, the Philippines, Puerto Rico and the United States, except one, were represented.

The Planning Committee sought a diversity of interest among those who were to participate, and made its recommendations to the Association with this objective in mind. Participants from anatomy departments would include those primarily interested in teaching neuroanatomy, microscopic anatomy and developmental anatomy, as well as gross anatomy. Participants with demonstrated interests in medical education, combined with the viewpoints and training of internists, surgeons, pediatricians, biologists, pathologists, etc., were also chosen to discuss the problems of teaching anatomy and anthropology.

A difficult task was the limitation of attendance. Many anatomists from this and other countries, as well as others interested in this discipline for diverse reasons, requested an opportunity to observe the proceedings of the Institute. The previously established policy of limited attendance and no observers was, however, retained.

The Institute consisted chiefly of morning and evening sessions. Brief general meetings preceded the small discussion meetings which were addressed to the seven topics selected by the Planning Committee for exploration. In order to facilitate informal discussion of these topics, the participants were divided into nine groups, each composed of 12 to 14 participants. To preserve continuity and at the same time allow for the injection of new viewpoints, two members were rotated out of each group into new ones each successive session.

Each of the nine groups included a chairman and a recorder or "analyst," who were designated prior to the meeting. No person served in these capacities more than once. The session chairmen and analysts met with the chairman of the Topic Committee concerned, both before the discussion sessions, to talk over plans for the meeting, and afterward to review the proceedings and contribute to the general summary which the topic chairman would present at the subsequent general session.

To initiate discussion, proposed agenda were provided which consisted of questions pertaining to each topic. Different groups put priority on different questions, making it possible for discussion to be directed toward a variety of topics, in spite of time limitations.

The agenda were to a large extent based on the results of the questionnaire study conducted earlier in the year and on topics discussed by the Topic Committees. The questionnaires were prepared by the Planning Committee of the Institute and the seven Topic Committees, and analyzed in cooperation with Dr. Helen H. Gee and her staff at the Association of American Medical Colleges. The questionnaire analyses afforded data which served as helpful background for discussion. The informal personal discussion at the Institute brought forth substantial elaboration and enrichment of opinion beyond that explored by the questionnaires.

The session devoted to anthropology was handled differently. This field was less familiar to most of the participants than were the basic anatomical sciences, and hence less suitable for discussion at informal sessions. Four formal talks were presented by anthropologists on diverse aspects of the subject. Dr. Gabriel Lasker, Wayne University, spoke on "Anthropology in Medical Education;" Dr. William Walter Greulich, Stanford University, on "Anthropology as an Ancillary Medical Science;" Dr. J. Lawrence Angel, the Daniel Baugh Institute of Anatomy of the Jefferson Medical College, on "Anthropology and Human Variation;" and Dr. Benjamin D. Paul, Harvard School of Public Health, on "Medicine's Third Dimension."

Three special talks featured afternoon sessions. Dr. J. Dixon Boyd, Cambridge University, discussed "Anatomy as Taught in the English Universities." Dr. William S. Verplanck, Stanford University, addressed the participants on "The Psychology of Learning." Dr. Barry J. Anson, Northwest-

ern University, spoke on "The History of Anatomy in Medical Education" (published in *Quarterly Bull., Northwestern Univ. Med. School* 30:80-94.

Except for these lectures, the afternoons were free for those without planning or discussion session responsibilities. This afforded ample opportunity for perusal of exhibit material and film presentations. A series of teaching films were shown under the supervision of Prof. J. E. Markee. Dr. J. Edwin Foster arranged the display of projection equipment. (See the list of films in Appendix E.)

Exhibits included a display of selected books and journals in the field of anthropology as related to medical education (see Appendix F); a selected collection of prints entitled *The Founders of Anatomy*, illustrating the development of anatomy from Galen to the mid-19th century was assembled by Dr. H. W. Magoun, Dr. Robert Moes, Dr. E. Mauer, Dr. Elmer Belt, and Louise Darling (two of these are reproduced in these pages). Cardioviews prepared by the American Heart Association and stereoscopic slides and wall projectors were also on exhibit.

Acknowledgment is due the Denoyer-Geppert Co., Chicago, Illinois; The General Precision Laboratories, Inc., Chicago, Illinois; The Triangle Continuous Projector Co., Skokie, Illinois; and the Williams and Wilkins Co., Baltimore, Maryland, for providing equipment and materials.

The Institute was made possible by generous financial assistance from the Commonwealth Fund and the National Heart Institute of the U.S. Public Health Service. In addition, the medical schools contributed by bearing a large share of the expenses incurred by their representatives. The Committee on Educational Research and Services of the Association of American Medical Colleges guided the early development of plans for the Institute and the Association staff assumed full responsibility for the mechanics of the Institute.

The facilities of the New Ocean House, Swampscott, Massachusetts, with the arrangements and organization provided by the Association of American Medical Colleges, contributed much toward the smooth and effective functioning of the Institute.

This report of the proceedings was compiled by Lura Street Jackson, in close cooperation with the editorial committee. It includes material drawn from all sessions of the Institute, and from responses to the questionnaires.

APPENDIX B

The Questionnaire

Early in the planning stages of the Institute a questionnaire was sent out to collect statistical and informational data as background and resource material for discussions at the Institute. It was hoped that this would decrease to some extent the subjective nature of the discussion and afford a factual basis beyond that of mere opinion in arriving at conclusions.

The information sought ranged from specific factual data which could be objectively reported to impressions, opinions, and retrospective considerations. Because the premedical preparation of the student, as well as the postdoctoral requirements of a knowledge of anatomy were also of interest, the questionnaires were addressed to two groups outside of the medical schools, undergraduate college deans and practicing physicians. In all, eight different cross-sections of opinion were tapped concerning various aspects of the teaching of anatomy and anthropology. Distribution and utilization of questionnaires are shown in the table.

Group addressed	Number distributed	Number Used		Percentage used of total number distributed
		Schools	Individuals	
Participants	94	87		92
Department chairmen	97•	90		93
Faculty	94	89	(487)	95†
First-year students	94	84	(700)	89†
Fourth-year students	94	84	(560)	89†
Medical school graduates	1140§		(650)	59§
Medical school deans	93	78		84
Deans of undergraduate colleges	165	145		88

•Two chairmen in each of three departments.

†These are percentages of schools from whom returns were received. The percentage of individual returns within schools is not known. Numbers in parentheses show the number of individual respondents.

§These are estimates. Two hundred questionnaires were sent directly to general practitioners and 94 participants were requested to distribute one to each of 10 specialists.

The Planning Committee was extremely gratified with the response to the questionnaires, which were for the most part answered with considerable thought and thoroughness. The massive amount of material obtained therefrom probably provides more information about anatomy and anthropology in medical education than has ever before been assembled.

Dr. Helen H. Gee, Director of Research for the Association of American Medical Colleges, and her staff assumed major responsibility for analyzing the results of the questionnaires. The tables and selected answers to open-ended or subjective questions that invoked essay-type replies were assembled according to relevance to the topics to be discussed at the Institute. Copies of the questionnaire analyses were then made available to all participants prior to the conference. Much of the data has been used in the compilation of this report.

TABLE A.1

ANATOMY COURSES OFFERED TO MEDICAL STUDENTS IN THE FIRST AND SECOND YEARS
(Chairmen group)

Course	Actual number of hours												Desired hours		
	Total			Lecture			Laboratory			Conference			No. respondents desiring		
	Range	Mean	N	Range	Mean	N	Range	Mean	N	Range	Mean	N	More	Less	Same
First Year															
Required (subject)															
Embryology	18 - 123	57	(32)	9 - 34	21	(27)	10 - 75	41	(22)	0 - 11	1	(25)	7	0	7
Gross anatomy*	80 - 496	337	(82)	10 - 150	61	(74)	160 - 450	262	(72)	0 - 100	14	(70)	12	7	26
Histology and/or microanatomy	80 - 300	153	(62)	15 - 70	43	(54)	40 - 250	110	(53)	0 - 46	5	(53)	7	0	21
Histology and embryology	115 - 280	201	(18)	0 - 90	53	(16)	80 - 216	138	(17)	0 - 60	10	(16)	7	1	3
Neuroanatomy and neurology	36 - 150	96	(68)	10 - 48	30	(62)	20 - 100	62	(62)	0 - 32	5	(59)	10	2	27
Combined course in anatomy	562 - 825	660	(4)	137 - 195	158	(4)	422 - 630	487	(4)	0 - 11	5	(4)	0	0	0
Elective (type)†															
Lecture	12 - 22	17	(4)	10 - 22	15	(4)	0	0	(0)	9	9	(1)	1	0	2
Laboratory	51 - 110	72	(4)	0	0	(0)	30 - 110	63	(4)	15 - 21	18	(2)	0	0	3
Lecture and laboratory	20 - 100	51	(11)	0 - 25	16	(11)	10 - 80	35	(11)	6	6	(1)	1	1	8
Primarily conference	10	10	(1)	0	0	(0)	0	0	(0)	10	10	(1)	0	0	1
Not specified	30 - 36	34	(3)	—	—	(—)	—	—	(—)	—	—	(-)	—	—	—
Second Year															
Required (subject)															
Applied anatomy	11 - 64	37	(6)	8 - 64	27	(6)	0 - 40	10	(6)	0	0	(0)	1	0	3
Neuroanatomy	28 - 102	76	(8)	22 - 45	34	(6)	20 - 70	54	(6)	0	0	(0)	2	0	2
Required (type)†															
Lecture	10 - 50	30	(4)	10 - 50	30	(4)	0	0	(0)	0	0	(0)	1	0	0
Laboratory	68	68	(1)	0	0	(0)	56	56	(1)	12	12	(1)	0	0	0
Lecture and laboratory	12 - 512	100	(13)	5 - 44	23	(12)	4 - 120	46	(11)	0 - 5	2	(2)	3	0	6
Not specified	10 - 224	101	(7)	—	—	(—)	—	—	(—)	—	—	(-)	0	0	5

*One school has 80 hours in the first year, 80 in the second, and 118 in the third.
†One or two respondents listed several courses, here combined in terms of the classification apparently receiving greatest emphasis.

TABLE A.2

FREE-RESPONSE DESCRIPTIONS OF EXPERIMENTAL EDUCATIONAL PROGRAMS

(Participants group)

There are no formal planned experiments in progress at this time. There is a conscientious effort in most of the basic science departments to make practical clinical application of the material presented. Men from the clinical departments are often invited in for conferences with the basic science classes, and members of the pre-clinical departments often contribute to clinical pathological conferences, etc. Members of the freshman class go on occasional ward rounds, supervised by the doctors in the Obstetrics-gynecology Department.

• • •

Neuroanatomy, neurophysiology and sophomore clinical neurology are being given as one integrated course by members of the three departments. Introduction to medicine—clinical presentations involving anatomy, biochemistry and physiology. Clinical presentations are frequently made in lieu of lectures in anatomy. Cancer biology is an elective which crosses departmental lines and members of several departments cooperate. Medical genetics also crosses departmental lines involving biochemistry, microbiology and anatomy.

• • •

We have correlated as much as possible the subject matter in gross anatomy, histology and neuroanatomy without interfering with the autonomy of the respective courses. In order to acquaint the freshmen students with the practical application of anatomy, one hour per week is used by the Department of Surgery, to present patients illustrating conditions and material covered in previous dissections. The Department of Radiology uses time taken from the gross anatomy course to teach principles of radiology. The conferences parallel the osteology assignments. In order to increase the students' power of observation and to acquaint them with sources of medical literature, they are required to prepare a paper describing an anomaly, malformation or pathologic condition. In so doing, they are supposed to relate the embryological or pathological condition which very likely contributed to the production of the abnormality. If possible, they also are supposed to mention what influence this abnormality may have had upon the individual's well-being. These reports are graded and contribute to the final anatomy grade. A course in the introduction to medicine is given to the freshmen. Four or five students are assigned to a preceptor who meets with them 1-2 hours per week to discuss their problems. The preceptor introduces as much medicine as he sees fit. One student quit medical school as a result of this course.

• • •

Neuroanatomy and neurophysiology are presented in a coordinated manner in a single course in basic neurology and have been for the past three years. Radiologic anatomy is presented as a regular part of the course in gross anatomy. Plans are being discussed for coordinating the presentation of endocrinology. Plans are being discussed for interdepartmental presentation of a graduate course in cytology.

• • •

It probably does not fall within the category of an experiment; but we have [employed] and are continuing to employ color TV of surgical operations as a teaching aid in a (so far) limited way. This tryout involves the surgical staff who comment during surgical procedures, largely on the anatomy involved, and after the operation in a conference type discussion of the case; again, largely confining the discussion to the importance of relations, landmarks, and the anatomical rationale for surgical procedures. During the TV sessions the students are in communication with the surgeon at all times. This permits questions to be asked both ways and permits the students to have points of interest stressed and discussed.

• • •

Neuroanatomy is given in the second semester of the second year. This has the advantage of being presented in a clinical manner but has the disadvantage of making hardships for the courses in physiology, pathology and physical diagnosis. Published *J. Am. Med. Coll.*, 8: 305-308, 1933. This is under investigation at present time and may be returned to the first year.

• • •

An experiment being carried out at the present time involves the separation of histology into a basic and applied portion. The basic which constitutes approximately one-half of the time allotted to histology is taught to the freshmen medical students during the first semester. The purpose of this portion of the course is to teach the elements of histology and to give a certain amount of embryology. The applied portion is taught during the first and second semesters of the sophomore year. The attempt here was to correlate closely the detailed histology of various parts of the body with the pathology that might be involved in these same parts. The course is taught and scheduled as part of pathology and the lectures either precede or follow a pathology laboratory.

• • •

Current curriculum devised last year to increase correlation between pre-clinical and clinical subject matter, consisted of lectures, demonstrations and presentation of appropriate cases from the hospital, e.g., embryology, genetics, growth, variation and environment. These were presented by coordinated instruction of staffs from anatomy, pediatrics and obstetrics. Most of the clinical specialties as well as pathology participated in this program of approximately 50 hours in the freshman year. Continuation of this program into the second year is being considered.

• • •

We have planned for next year a reorganization of courses and subject matter so that anatomy, physiology and biochemistry will be taught concurrently during the first year of medicine. So far as possible, subject matter will be considered at about the same time in the three departments, and conferences between the teaching faculty of the three departments will help to divide the responsibility for presentation of the different phases of a given area. One hour each week—actually 1½ hours—will be devoted to a correlation exercise, presented each week by a representative of each of the three departments and clinical members. By use of patients, panel discussions, etc., various subjects will be treated in a correlative way and student participation by questions, suggestions, etc., will be encouraged. While each of the three departments will sacrifice a few hours of allotted time, it is hoped that the correlative treatment of material will provide better teaching and more retention by the students.

• • •

We are using a partially integrated program.

All morphology, except head and neck, is given in the first 13 weeks in which gross and microscopic anatomy is integrated with embryology. The next seven weeks' assignment is devoted to a very close integration of neuroanatomy—neurophysiology with gross anatomy and embryology. An article by Paul G. Roofe, entitled "The Science of Anatomy in an Integrated Program," appeared in the *Transactions of the Kansas Academy of Science* 58:1-8, 1955. This article pointed up the place anatomy should play in our program. It stressed the idea that modern science throughout its entire ramification is stressing form and pattern. Since anatomy has been conceived and taught chiefly as form and pattern, behavior is the expression these patterns take.

• • •

An experiment to eliminate the necessity for examinations has been carried on for some time. The students are required to write up a progress report at the end of each laboratory period which is a log of their daily activities and a record of their rate of learning. Examinations have been given in the routine manner and attempts have been made to see if these grades coincide with the impressions that one would obtain from examination of the progress reports. Thus far, the results from these two methods of evaluation are not identical, and it is doubtful if the progress report could be substituted for the examinations.

• • •

A course in applied anatomy (2nd year, one semester, 64 hours of lecture) is conducted by anatomist with guest lecturers from clinical departments, who talk about anatomy or clinical facets of their specialty. Clinicians lecture about one-fourth of total. This has been very successful and has been in effect 15 years or so. A combination of cross-sectional anatomy, radiographic anatomy, and living anatomy is given in a 64 hour course following the basic dissection course and has provided many desirable results —especially better preparation for physical diagnosis, surgery and radiology.

• • •

The introduction this year of a combined interdepartmental correlation hour in which patients are presented and discussed on the basis of the application of the basic sciences. All clinical departments—anatomy, physiology and biochemistry—are involved in this.

• • •

Radiographic anatomy—given by members of the department of Radiology (employing roentgenograms), weekly (on Saturdays) for two quarters.

• • •

In the course in gross anatomy a weekly clinical lecture by an outstanding clinician is given relating to the material of the week. Questions by students addressed to the clinician take up the last part of the meeting. As part of the course in x-ray anatomy for sophomores, chest films of each student in the class are taken and returned to the student for execution of his own cardiac measurements. The student correlates these measurements with height and weight indices utilizing cardiac prediction tables made available to the student. This also gives the student an incidental opportunity to study his own thoracic cage, pleura, lung and diaphragm.

• • •

In our department methods of teaching vary considerably. Thus in histology this past year lectures were reduced to a minimum and were substituted with quizzes and discussions over the laboratory work and textbook assignments. In one section of gross anatomy lectures were also reduced to a minimum and substituted with discussions in groups of 25 while in the laboratory more emphasis was placed on "table quizzes" than in the past. More and more surgical residents are being utilized as laboratory assistants and are given opportunity to present the principles of "applied anatomy." Considerable emphasis is now placed on normal radiographic anatomy, one room being utilized for rotating exhibits of radiographs with an assistant in charge. Every other year with the aid of a professor in Education a seminar in teaching in professional colleges is conducted for the benefit of graduate students and others who expect to follow teaching as a career in such professional colleges as Dentistry and Medicine. These seminars have proved very helpful to prospective teachers.

• • •

Students are given an opportunity to participate in experiments conducted in histology, neurology and gross anatomy. In gross anatomy a program has been in effect for some years wherein the mechanics of dissection are completed on a regional basis in three-fourths of the time available leaving one-fourth of the time for intensive integration and review on a systemic basis. The student does his review in any way he sees fit and without supervision or progress examinations. The results of this program have been most salutary. As indicated by results of final examinations nothing is sacrificed by such a program and a great many things are gained.

• • •

A procedure of long standing, modified with time, is the correlation in the anatomical subjects. It is still in force, as indicated. Publications are: *Anat. Rec.*, 32: 279-282; *Method and Problems of Medical Education*, 16th Ser.: 229-232; *Anat. Rec.*, 117: 819-822.

An innovation this year is the Correlation Conference for first year students. This is a required session covering, in order, certain biographic surveys of famous men in medicine, until the student has some background in more than one basic science; then sessions usually addressed by more than one member of the faculty discussing the relationships of various basic science material inter se and to clinical medicine.

Started two years ago, Pathology holds, in the spring trimester, conferences on different diseases, using a clinical-pathological history, with each basic science and all appropriate clinical departments represented. Discussion has on occasion been searching and almost violent in the opinions expressed. They serve excellently to underline the diversity of opinion prevailing. This year, members of various departments, anatomy included, are invited to participate in surgical rounds. This has had great value and should be extended.

• • •

Courses in "Physical Diagnosis" and "Surgical Seminar" as an introduction to clinical medicine and surgery. These courses are closely coordinated with Gross Anatomy.

• • •

Several basic science departments experimented with the requirement of a special study or research project for the medical student, offered during the second semester of the sophomore year. One member of the faculty has experimented at some length in an effort to find the most satisfactory place in the curriculum for the offering of embryology. He is now convinced that it should come at the end of the histology course, as by this time the students have also completed a good portion of the gross course and some introduction to neuroanatomy. In short, the embryology can be used in some measure as a review of at least certain features of the other anatomy courses.

• • •

The course in Bioanatomy (gross and microscopic) begins with a two and a quarter weeks session on the bioanatomy of the central nervous system (gross and microscopic aspects). With this knowledge of one great integrative mechanism as a background, formal study is begun in gross and microscopic anatomy. This experiment has been in effect for fully ten years and we find it very productive of understanding the human body.

The course in embryology is not a concentrated one. Development of the pig embryo is studied only after the gross dissection of the areas to be considered are dissected. This method tends to avoid a freezing of one's thinking by terminology and gives added zest to the understanding of precepts and concepts of embryology.

• • •

We are currently attempting a modified integration of the basic sciences by scheduling the subject sequence in each discipline so that during a given quarter many topics are dealt with by all or the majority of the basic sciences.

• • •

The method of prosection. A group of four students prepare a definite dissection ahead of time and present it to the rest of the class. This is done in rotation by each group of four students in the class.

• • •

A new conjoint course in "Human Growth and Development" involving embryology, postnatal development, fetal physiology and psychiatry. Conjoint endocrinology—jointly given by anatomy, physiology and biochemistry.

• • •

Our experiment was reported at the Biochemistry, Physiology and Pharmacology Institute in 1953. Anatomy is completely correlated with the other subjects and the teaching is spread over three years.

• • •

The Anatomy Department has been involved in two major experiments in education. The first is the organization of a combined course in neuroanatomy and neurophysiology. The same number of credit hours in the combined course were kept as was the case with the previous separate courses. Neurology is also introduced into this course and weekly clinics are held in which the physiological and anatomical aspects of the patient are discussed as well as the neurological aspects. This course has been in operation for four years and we feel it is very successful. A second integrated course has been introduced which is the course in endocrinology, a required course for all medical students. This course is taught by the Departments of Anatomy and Biochemistry in the main. The course consists of a chemical demonstration of the various hormones, their metabolism rate and function from both a chemical and structural point of view. Various other individuals who are specialists in some phase of endocrinology are called upon to aid in our teaching, but the main teaching load is carried by our two departments. Laboratories consist of studies of histological preparations and the performance of a research project in which the students are required to perform their work in groups of five. Bi-weekly conferences are held and weekly clinics are presented in which patients are demonstrated and clinical approaches to endocrinology are emphasized. This course, we feel, is now quite successful although it was a great deal of work getting it under way. We have experimented from time to time with major rearrangements in courses in gross anatomy and histology. These have involved, however, only changes in distribution of time and a correlation of histology with a course in biochemistry. Our ideas concerning these two courses have been in the preliminary stages although we have attempted a few innovations.

• • •

Since 1944 we have had a completely correlated and integrated course in freshman anatomy which comprises all of the phases of anatomy (gross, micro, neuro and developmental). This is described quite completely in "Freshman Anatomy as a Correlated Course," *J. Assoc. Am. Med. Coll.*, May 1949. See also "Symposium on the Closely Correlated or Integrated Course in Anatomy," by Congdon, Kampmeier, Hobbes and Huber in *Anat.* Rec. 117: No. 4, December 1953.

• • •

Weekly integration seminars, participated in mainly by members of clinical departments, are now in the first year; they have proved successful and will be continued. The seminar programs are varied, but most of them aim toward orientation of the first-year students in the bearings of their studies on medicine.

• • •

Three years ago we decided to reorganize our teaching methods in microscopic anatomy by introducing as much audio-visual material as possible to both lecture and laboratory sections. This material now comprises several categories: (1) A very extensive library of 2 x 2 Kodachrome transparencies, both photomicrographs and photographs of selected illustrations, charts, etc. Many of these were prepared as stereos and are projected as such in the lecture room. (2) A list of several excellent movies related to microscopic anatomy, which are rented as needed; some of these we have purchased. (3) Several hundred specially prepared demonstration histology slides. These enable the students to see the results of special techniques which have been applied to the tissues and organs currently being studied. A labeled photomicrograph of the field being demonstrated and a brief written statement of facts pertinent to the field is placed beside each demonstration 'scope. (4) Gross preserved and fresh preparations, models and charts. In order to provide time for the use of this visual material we no longer require the students to make detailed drawings of the routine preparations contained in their loan set of slides. Rather, they are encouraged to make accurate and careful observations, making only notes and sketches which they feel might be helpful to their own interpretation of the material. The results of this experiment have been gratifying indeed. The students work with far more enthusiasm, interest and initiative and depend much less on the instructors in the laboratory. The results of written and practical examinations show conclusively that our students are now gaining a far better knowledge of the subject compared to students of previous years. Perhaps most significant of all, our pathologist has several times commented on the improvement which he has noticed in the last two or three classes passing through his hands.

• • •

Current teaching procedure at Yale has been described by Dean Lippard in a recent issue of *J. Med. Educ.* This is no longer an experiment.

• • •

For the past five years we have conducted *living and radiological anatomy* courses concurrently with the various stages of dissection in laboratories specially equipped for the purpose of studying the *living human*.

• • •

Two years ago we tried a very ambitious program of many conferences with small groups of students. This is still an important part of our teaching method but had to be reduced because

of the lack of time. Recently we had experimented with giving special assignments to volunteer students who then report on their observations and reading to the entire class. This looks very promising. The evaluation of any of our teaching experiments is based on student reaction such as enthusiasm in active participation and . . . questions which students ask of staff members. We are fortunate in that all our staff members in anatomy are interested and enthusiastic about our new approaches to the teaching of anatomy. We also are fortunate in having good understanding and good will among all the members of the staff even though we never entirely agree.

• • •

Instead of having separate examinations in anatomy in the second and third years, members of the staff of the Anatomy Department are appointed examiners in the second year medicine and in third year surgery. These anatomists participate in the oral examinations in Clinical Medicine (2nd year) and in Clinical Surgery (3rd year). They examine in anatomy, but the results help to determine the student's mark in medicine or surgery, as the case may be. This experiment, in progress for several years, seems to be working satisfactorily.

• • •

So far, there was no attempt to change the teaching in gross anatomy. However, recently, embryology has been switched from the first to the second year because embryology, being a time-limited subject, has to rely on basic knowledge of the organs. This does not meet entirely the expectations and we will try to integrate the two subjects more intimately in the coming years. A clinical department of neurology has been established in the new university hospital and it is expected that neuroanatomy will be partly "illustrated" by clinical cases.

• • •

We have been working on the development of a suitable integrative course designed to correlate all facets of anatomy. We have made changes each year and are now completing our fifth year. We have had some success without destroying the fundamental unity of either histology or gross anatomy.

• • •

Photomicrographs in color are used for term examinations in histology and embryology. It is time saving and more objective. The marks correlate with those obtained by standard procedure.

• • •

See: (a) Washburn, A. H.: "Medicine as Human Biology," *J. Med. Educ.* December 1953, *and* (b) Morton, D. J.: "Anatomical Pedagogy and Features of a Revised Course," *J. Assoc. Am. Med. Coll.* 8: No. 5, 1933.

TABLE A.3

BUDGETED POSITIONS IN ANATOMY DEPARTMENTS DURING THREE YEARLY PERIODS BETWEEN 1945 AND 1956

(Chairmen group)

Rank	Number positions listed						No. of depts.	Ratio of no. positions to no. departments	
	None	1–3	4–6	7–9	10	Total no.		A*	B†
					1945–1946				
Professor	0	68	3	0	0	127	71	1.8	1.8
Associate Professor	7	54	1	0	0	93	62	1.5	1.5
Assistant Professor	7	54	3	1	0	108	65	1.5	1.7
Instructor	7	45	5	1	0	105	58	1.5	1.8
Assistant	6	31	3	0	2	90	42	1.2	2.1
Graduate student	14	17	5	0	1	66	37	.9	1.8
					1950–1951				
Professor	0	76	4	0	0	151	80	1.8	1.9
Associate Professor	6	62	4	1	0	137	73	1.7	1.9
Assistant Professor	7	54	3	1	0	126	65	1.5	1.9
Instructor	9	40	9	2	0	117	60	1.4	2.0
Assistant	6	28	8	3	1	118	45	1.2	2.6
Graduate student	9	27	10	2	1	121	49	1.5	2.5
					1955–1956				
Professor	0	77	10	0	0	184	87	2.1	2.1
Associate Professor	6	64	9	1	0	157	80	1.8	2.0
Assistant Professor	3	64	13	1	0	173	81	2.0	2.1
Instructor	4	63	9	1	0	162	77	1.9	2.1
Assistant	7	31	11	1	4	153	54	1.8	2.8
Graduate student	8	34	10	1	2	137	55	1.6	2.5

*Ratio computed with blank responses counted as zero positions.
†Ratio computed with blank responses considered "no response" and not counted.

TABLE A.4

SALARY SOURCE ACCORDING TO FACULTY RANK

(Chairmen group)

Rank	Per cent per salary source						
	School budget	Research grant	Fees or services	School budget & research grant	School budget & fees or services	Other	No salary, voluntary
Chairman or professor (N = 184)	96	1	0	1	1	0	1
Associate professor (N = 150)	92	3	0	2	1	1	1
Assistant professor* (N = 169)	92	2	1	1	2	0	2
Instructor† (N = 172)	79	4	1	1	5	2	8
Fellow, assistant, associate (N = 125)	62	8	8	0	2	6	14
Not known (N = 34)	79	18	0	3	0	0	0
Total	85	4	2	1	2	2	4

*2% no response, not counted. †1% no response, not counted.

TABLE A.5

REGULAR COURSES IN DEPARTMENTS OF ANATOMY FOR NONMEDICAL STUDENTS

(Chairmen group)

Type of student	Number of respondents reporting:			Number of students		Number of semester hours						No response
						Credit hours			Clock hours			
	No course	Some courses	No response	Range	Median	Range	Median	N*	Range	Median	N*	
Special Courses												
Dental	79	7	4	40 - 113	74	1 - 16	3	3	30 - 99	64	2	2
Nurse	67	19	4	5 - 300	49	2 - 4	4	9	24 - 132	60	7	3
Physical education	79	7	4	10 - 60	30	3 - 8	3	5	90	90	1	1
Physiotherapist	75	11	4	3 - 88	16	2 - 8	6	5	90 - 288	158	3	3
Technologist	81	5	4	5 - 40	15	2 - 4	3	3	40 - 90	65	2	0
Radiological technician	83	3	4	3 - 10	7	3	3	1	90	90	1	1
Arts	82	4	4	1 - 30	4	3 - 8	3	3	288	288	1	0
College	84	2	4	8 - 20	14	2	2	1	90	90	1	0
Graduate	71	15	4	2 - 40	6	3 - 35	16	8	90	90	1	6
Other	79	7	4	4 - 350	30	3 - 6	3	3	60 - 88	74	2	2
Gross Anatomy												
Dental	60	26	4	13 - 140	63	5 - 24	10	13	132 - 488	256	11	2
Nurse	74	12	4	12 - 200	80	2 - 5	3	4	44 - 80	45	3	5
Physical education	81	5	4	15 - 60	50	1 - 4	3	3	90 - 160	125	2	0
Physiotherapist	73	13	4	3 - 88	28	3 - 9	4	6	120 - 220	150	3	4
Technologist	84	2	4	10 - 11	10	3	3	1	—	—	0	1
Radiological technician	86	0	4	—	—	—	—	0	—	—	0	0
Arts	83	3	4	2 - 4	2	8	8	1	256 - 357	306	2	0
College	86	0	4	—	—	—	—	0	—	—	0	0
Graduate	72	14	4	2 - 10	5	12 - 30	13	4	256 - 594	348	6	4
Other	76	10	4	2 - 75	15	3 - 4	4	2	220 - 270	240	3	5
Microscopic Anatomy												
Dental	64	22	4	13 - 140	60	3 - 16	6	12	98 - 187	154	9	1
Nurse	83	3	4	65 - 120	85	2	2	1	—	—	0	2
Physical education	86	0	4	—	—	—	—	0	—	—	0	0
Physiotherapist	83	3	4	2 - 88	45	8	8	1	—	—	0	2
Technologist	84	2	4	6 - 15	10	3	3	1	—	—	0	1
Radiological technician	86	0	4	—	—	—	—	0	—	—	0	0
Arts	82	4	4	2 - 19	3	3 - 5	5	3	236	236	1	0
College	86	0	4	—	—	—	—	0	—	—	0	0
Graduate	71	15	4	2 - 10	5	6 - 30	8	4	156 - 256	196	6	5
Other	84	2	4	10 - 45	28	3	3	1	—	—	0	1

*Number of respondents reporting.

TABLE A.6

STAFF MEMBERS SUPPLEMENTING INCOME BEYOND DEPARTMENTAL SALARY
(Chairmen group)

Per cent of staff supplementing income	Per cent of departments*
0	39
1 - 20	29
21 - 40	16
41 - 60	9
61 - 80	2
81 - 100	5

*Responding N = (82)
Total N = 90
No response (% of total N) = 9%

TABLE A.7

DEGREES HELD BY FULL-TIME FACULTY
(Faculty group)

Faculty rank	No. holding each degree or combination							
	M.D.	Ph.D.	M.D. & Ph.D.	M.D. & M.A. or M.S.	M.D. & other	M.A. or M.S.	Other degrees	No response
Chairman (N =75)	13	39	17	4	2	0	0	0
Professor (N =76)	9	50	14	3	0	0	0	0
Associate professor (N =116)	13	81	14	4	1	2	1	0
Assistant professor (N =116)	24	75	11	2	0	2	1	1
Associate, fellow, lecturer, instructor, assistant, etc. (N =104)	14	73	1	1	1	12	1	1
Total (N =487)	73	318	57	14	4	16	3	2

TABLE A.8

ACTUAL AND PREFERRED TIME ALLOTMENT OF FULL-TIME FACULTY MEMBERS
(Faculty group)

Activity	Actual percentage time			Number of respondents who:			Preferred percentage time		
	N*	Range	Median	Spend no time	Have no preference	Prefer no time	N*	Range	Median
All Faculty Members									
Teaching required medical courses	(479)	02–100	40	5	68	21	(395)	05– 90	33
Teaching elective courses	(143)	01– 63	05	341	68	216	(200)	01– 63	10
Seminars	(266)	01– 25	02	218	68	183	(233)	01– 35	05
Research	(455)	05–100	45	29	67	16	(401)	05–100	50
Committee and administrative	(317)	01– 98	10	167	68	173	(243)	01– 70	06
Other	(167)	01– 68	10	317	68	311	(105)	01– 60	10
Chairmen									
Teaching required medical courses	(73)	10– 75	27	1	7	3	(64)	10– 70	30
Teaching elective courses	(27)	02– 45	06	47	7	28	(39)	01– 55	10
Seminars	(39)	01– 18	04	35	7	28	(39)	01– 35	05
Research	(69)	05– 70	25	5	6	2	(66)	15– 80	40
Committee and administrative	(73)	01– 75	30	1	7	8	(59)	01– 68	15
Other	(23)	01– 68	10	51	7	48	(19)	01– 25	10
Professors									
Teaching required medical courses	(75)	05– 80	37	1	12	3	(61)	05– 70	35
Teaching elective courses	(27)	01– 50	08	49	12	30	(34)	01– 30	05
Seminars	(42)	01– 15	02	39	12	31	(33)	01– 25	03
Research	(72)	05–100	45	4	12	4	(60)	05–100	50
Committee and administrative	(56)	01–100	10	20	12	25	(39)	01– 28	10
Other	(26)	02– 60	07	50	12	51	(13)	02– 60	10
Associate Professors									
Teaching required medical courses	(114)	05– 95	40	2	21	7	(88)	10– 90	35
Teaching elective courses	(38)	01– 40	09	78	21	55	(40)	01– 15	05
Seminars	(58)	01– 25	03	58	21	48	(47)	01– 25	05
Research	(110)	05– 90	45	6	21	3	(92)	15– 90	50
Committee and administrative	(86)	01– 50	05	30	21	40	(55)	01– 30	05
Other	(53)	01– 60	20	63	21	64	(31)	01– 50	10
Assistant Professors									
Teaching required medical courses	(115)	02–100	40	1	16	3	(97)	11– 75	30
Teaching elective courses	(32)	01– 63	09	84	16	48	(52)	02– 63	10
Seminars	(69)	01– 10	02	47	16	41	(59)	01– 10	03
Research	(109)	10– 80	50	7	16	2	(98)	18– 80	50
Committee and administrative	(66)	01– 98	05	50	16	47	(53)	01– 70	05
Other	(34)	01– 60	14	82	16	75	(25)	01– 50	08
Instructors, Fellows, Lecturers, Associates, etc.									
Teaching required medical courses	(102)	10–100	40	0	12	5	(85)	10– 75	35
Teaching elective courses	(19)	01– 40	03	83	12	55	(35)	01– 20	09
Seminars	(58)	01– 08	02	44	12	35	(55)	01– 10	03
Research	(95)	05– 80	50	7	12	5	(85)	25– 85	50
Committee and administrative	(36)	01– 35	05	66	12	53	(37)	01– 20	05
Other	(31)	01– 58	20	71	12	73	(17)	02– 40	15

*Number of respondents reporting.

TABLE A.9

DEGREES HELD BY ANATOMY STAFF MEMBERS
(Chairmen group)

Faculty rank	Per cent holding degrees								Total faculty $N = 838$	
	MD	PhD	MA or MS	Other, incl. foreign degrees but not AB & BS	MD and PhD or ScD	MD and MA or MS	MD and other, incl. foreign degrees	BA or BS	Responding N	No response (% of total N)
Chairman and professor	22	56	1	2	16	1	2	0	(184)	0
Associate professor	20	64	3	1	10	2	0	0	(149)	1
Assistant professor	30	57	2	4	7	0	0	0	(171)	1
Instructor	40	48	8	2	0	0	0	2	(173)	0
Fellow, assistant associate,	67	9	8	1	1	2	2	10	(121)	3
Not known	64	15	3	15	3	0	0	0	(34)	0
Total	35	47	4	3	7	1	1	2	(832)	1

TABLE A.10

MAJOR INTERESTS OF ANATOMY STAFF MEMBERS
(Chairmen group)

Faculty rank	Per cent of faculty whose major interest is:							Total faculty $N = 838$	
	Teaching	Research	Teaching and research	Medical practice	Teaching and practice	Teaching, research, practice	Not usable	Responding (N)	No response (% of total N)
Chairman and professor	26	14	38	0	0	0	22	(182)	1
Associate professor	25	16	38	1	0	0	20	(149)	1
Assistant professor	21	11	39	2	0	0	27	(170)	1
Instructor	19	11	34	8	2	0	26	(168)	3
Fellow, assistant, associate	42	10	17	9	1	0	21	(105)	16
Not known	16	4	50	4	0	8	12	(25)	26
Total	25	12	35	4	1	*	23	(790)	5

TABLE A.11

INSTITUTIONS GRANTING HIGHEST EARNED DEGREE TO ANATOMY STAFF MEMBERS

School granting degree to 4 or more anatomists	Number of faculty at each rank (see note)						
	A	B	C	D	E	F	Total
Baylor U.	1	0	4	0	1	0	6
Brown U.	2	3	2	1	1	1	10
Columbia U.	3	8	3	6	0	0	20
Cornell U.	7	12	9	4	1	0	33
Dalhousie U.	0	0	1	1	2	0	4
Duke U.	3	0	3	2	0	0	8
George Washington U.	1	0	1	4	1	0	7
Harvard U.	7	8	7	5	2	3	32
Indiana U.	2	1	2	3	0	1	9
Jefferson Medical College	0	0	1	1	7	0	9
Johns Hopkins U.	7	3	1	12	1	1	25
Laval U.	3	0	0	0	8	0	11
Loyola University, Ill.	0	0	2	1	2	0	5
McGill U.	2	2	1	1	1	0	7
Medical Evangelists	0	2	2	6	1	0	11
New York University	4	6	6	4	2	0	22
Northwestern U.	7	1	5	1	0	0	14
Ohio State U.	2	4	2	3	0	0	11
Princeton U.	2	2	1	1	0	0	6
Queens U.	1	0	0	1	3	0	5
Rutgers U.	0	0	1	4	0	0	5
St. Louis U.	1*	4	4	2	3	0	14
Southwestern U.	0	0	0	4	1	0	5
State U. of Iowa	8	5	4	3	0	0	20
Stanford	3	3	0	1	0	0	7
Tulane U. of Louisiana	2*	2*	1	4	0	0	9
U. of Buffalo	0	0	1	4	2	0	7
U. of California at San Francisco	4**	1	7*	3	1	0	16
U. of Chicago	18*	11	7	4	0	0	40
U. of Cincinnati	0	2	3	0	0	0	5
U. of Georgia	2*	1*	1	4	0	0	8
U. of Illinois	6	2	4	3	1	0	16
U. of Kansas	3	2*	3	4	0	0	12
U. of Manitoba	0	1	1	0	10	1	13
U. of Maryland	1	1	4	4	1	0	11
U. of Michigan	9	6	11	8	1	0	35
U. of Minnesota	8	6	4	7	8	0	33
U. of Montreal	3	2*	3	0	8	0	16
U. of Nebraska	1	0	2	3	4	0	10
U. of Pennsylvania	1	0	4	2	1	0	8
U. of Pittsburgh	1	1	2	4	4	0	12
U. of Rochester	1	2*	1	2	0	0	6
U. of Tennessee	2*	1	3*	1	0	0	7
U. of Texas	1	0	2	1	4	0	8
U. of Toronto	2	3	1	0	1	13	20
U. of W. Ontario	1	0	2	2	2	0	7
U. of Wisconsin	7	3	3	4	0	0	17
Vanderbilt U.	3*	2	1	1	1	0	8
Washington U.	2*	5	2	1	0	0	10
Western Reserve U.	2	4*	3	3	7	0	19
Yale U.	14	14	2	0	0	1	31
Unlisted foreign universities	17*	12	10	5	7	3	54
Not known	0	0	1	2	11	8	22

Note: Faculty rank as follows:

A. Chairman and professor
B. Associate professor
C. Assistant professor
D. Instructor
E. Fellow, assistant, associate
F. Rank not known

*Of 59 faculty members holding both M.D. and Ph.D. degrees, 21 were granted these degrees by different institutions. Each asterisk indicates an M.D. degree granted to a faculty member also counted elsewhere with the institution from which he received his Ph.D. degree.

TABLE A.12

FIELDS OF STUDY OF ANATOMY STAFF MEMBERS
(Chairmen group)

Field of study	Percent by faculty rank*						
	A	B	C	D	E	F	Total
Major Field							
Anatomy							
General anatomy	29	30	31	26	20	3	26
Embryology	3	3	3	3	0	0	2
Histology	5	6	5	5	2	0	5
Neuroanatomy	9	3	3	2	2	0	4
Anthropology and paleontology	0	2	3	2	0	0	1
Applied medical sciences	23	19	32	31	57	85	33
Biology	25	31	18	24	9	9	22
Other	6	6	5	7	10	3	6
Major field not indicated	7	5	10	11	27	0	11
(per cent of total N)							
Responding N	(172)	(142)	(155)	(154)	(91)	(34)	(748)
Total N	184	150	172	173	125	34	838
Minor Field							
Anatomy							
General anatomy	18	16	19	14	29	0	18
Embryology	3	8	6	7	0	0	2
Histology	5	7	4	9	5	0	6
Neuroanatomy	2	3	3	1	2	0	2
Anthropology and paleontology	2	1	2	1	0	0	1
Applied medical sciences	2	4	8	8	17	0	6
Biology	18	20	16	13	5	0	16
Other	48	35	42	43	42	0	43
"None"	2	6	0	4	0	0	2
Minor field not indicated	33	39	41	55	66	100	48
(per cent of total N)							
Responding N	(124)	(92)	(102)	(77)	(42)	(0)	(437)
Total N	184	150	172	173	125	34	838

*Faculty rank as follows:
A. Chairman and professor
B. Associate professor
C. Assistant professor
D. Instructor
E. Fellow, assistant, associate
F. Rank not known

TABLE A.13

SCHOOLS INDICATING ADDITIONAL BUDGETED FACULTY POSITIONS AS NECESSARY OR DESIRABLE
(Chairmen group)

Rank of position	Number of chairmen citing additional positions wanted										None Nec.
	1 position		2 positions		3 positions		4 positions		Unspecified number		
	Nec.	Des.	Nec.	Des.	Nec.	Des.	Nec.	Des.	Nec.	Des.	
Professor	2	3	0	1	0	0	0	0	0	0	
Associate professor	3	3	0	1	0	0	0	0	0	0	
Assistant professor	7	5	1	1	1	0	1	0	0	0	
Instructor	4	6	2	6	2	2	0	0	0	0	
No rank specified	2	0	2	4	1	0	0	2	11	24	
TOTAL	18	17	5	13	4	2	1	2	11	24	16

TABLE A.14

FREE-RESPONSE COMMENTS: BLOCK TIME vs. CONCURRENT TEACHING OF ANATOMY COURSES

(Participants group)

Responses favoring concurrent teaching

Allows for better evaluation of student performance when several disciplines are involved. More student time for revision and absorption. Lessens student "anxiety," avoids sameness. Gives staff more freedom and more regular time for routine preparations for classes.

• • •

Opportunity to integrate with other courses—both teacher and student. Student can relearn during the course. Students have more opportunity to read, etc.

• • •

Students learn more for they have more time to think and assimilate. There is less cramming and more time for integration, thus the material is retained longer.

• • •

More opportunity for integration with other courses.

• • •

Students can digest information better, given more time, and can correlate anatomical facts with other information to greater extent. Staff can carry on research program while teaching—difficult under block system.

• • •

We feel that concurrent teaching of anatomy allows better integration with other basic science courses. Also that it lends variety to the student's course work.

• • •

More efficient learning over a greater expanse of time and in relation to other courses. More time for individual contacts.

• • •

Allows for varying mental adaptation of students to anatomy and medical school courses generally. Permits the student to forget and revise in the light of new experience in the manner in which we all gain our clinical or other experience. Affords opportunity for correlation with other courses. Relieves strain on teaching staff which is already too severe and has caused us to lose staff. Students quickly reach a saturation point when placed on intensive courses.

• • •

Although I have no strong feeling in the matter I prefer several simultaneous courses in the hope that the various subjects can be integrated. It is felt that it takes time for Anatomy "to sink in."

• • •

Block time might benefit the students. But administrators are apt to suggest other courses for those "empty" times that were intended for research.

• • •

Having very little experience with an intense schedule, concurrent teaching appears to us more profitable for the student, since more time is available to assimilate the various subjects taught. However, the intense schedule seems to be more advantageous to the staff, from a research point of view.

• • •

Gives more time for students to absorb and think about subject. Makes correlation with other subjects easier. Enables staff to assess students more efficiently.

• • •

Time is essential for any subject with great volume of facts. Correlation with other courses adds interest and motivation. The essential yardstick is the effect on the student mind and the block system has a very bad effect.

• • •

No advantage to staff; for students it (a) spreads learning time, (b) permits some measure of integration with other knowledge being acquired, (c) potentially more adaptable to further integration among basic sciences.

• • •

Students have needed time for absorbing if over longer period. From Professor's point of view with difficult staff the more concentrated course is advantageous; more time for research.

• • •

Learning process works best when material is spread out over a longer period. Get to know students better.

• • •

If my main job is teaching then the consideration for students is of major importance—not my research. Better lectures are provided and also more helping of students if the schedule is not so intense. There is also more time for composing exams, and reading them.

• • •

Greater opportunities and more time for digestion and assimilation, and far greater correlations by students. Opportunity for continuous research and less fatigue on part of staff.

• • •

We feel it is pedagogically sounder and much easier to correlate Gross, Microscopic and Neurology. Actually the "Quarter System" lends itself better to a wider spread than to concentrated doses.

• • •

Lengthening the period of teaching leads to better results as psychologists have pointed out.

• • •

Gives faculty more time for research. Gives more satisfactory teaching results.

• • •

Repeated experiences have shown that the students at this school require a rather lengthy period of adjustment before "catching on" to what anatomy is all about, how to study for it and, especially, to conquer the nomenclature.

• • •

Permits time for detailed learning, and integration of knowledge with other knowledge. "Block time" is too concentrated.

• • •

Time is a considered factor in learning and retention. Also this does not allow the large time gaps in the curriculum between a course and its possible application in subsequent courses: such as between Histology and Pathology.

• • •

There is more time for the students' cerebral gelatin to absorb the anatomical facts and to retain them.

• • •

It is our impression that students and staff do better work under concurrent teaching; however, no proof can be offered.

• • •

Would emphasize Humanics as well as Mechanics of human body. Would more likely effectively stress the fact that a patient has a disease as the fact that a disease has a patient. Basic subjects become more meaningful.

• • •

Learning is a repetitive process and understanding is slowly gained by prolonged exposure.

• • •

Staff: opportunity to present subject in a broader setting. Students: opportunity to see material studied in a broader perspective—less

concerned with minutiae.

• • •

Better correlation of courses. No advantage to staff.

• • •

Greater opportunities for integration, better assimilation, greater opportunities for more extensive reading and problem or investigative work for student. No special advantage to staff, rather a disadvantage.

• • •

Block time favors instructor's time in teaching and is easier to schedule; it is opposed to integration, however, and leads to isolation. Concurrent, longer courses favor integration and promote association of different departments.

• • •

Better opportunity for correlation by students. More effective teaching by staff in "non-block" courses. More effective as a teaching method because of opportunity to repeat and enlarge subject matter as concurrent courses proceed. Tends to approach a unified program which I believe to be most effective.

• • •

More time for assimilation of material by students. Gives staff a less intensive schedule and less fatiguing as a whole.

• • •

I believe concurrent teaching makes the subject matter mean more to students and makes it easier for them to learn the correlation between different courses. This may lead to correlation on the part of instructors in presenting material. It leads to more cooperation and understanding between staff members in anatomy and those in biochemistry and physiology.

• • •

Less pressure on students. Time to absorb material. More enjoyment in learning. A more sound educational practice.

• • •

Disadvantage to staff in terms of continued inability to concentrate on research. Advantages to student: (1) time to reflect and assimilate, (2) correlation and approach to subject from different viewpoints.

• • •

Time for repetition.

• • •

Longer period offers better opportunity for correlation and integration. Gives more opportunity for conferences with student groups and more time for student absorption of subject matter.

• • •

The present anatomy curriculum at CME represents the block plan—in one semester, 8 sessions (4 hours each) per week. This is too intensive; students become surfeited, and staff devotes entire time to teaching, and has no time for research during the teaching semester.

• • •

For the student, more time for assimilation, opportunities for correlation with other basic science courses. For the staff, less pressure on preparation time, more continuity in research effort and the value of time in maturation and evaluation.

• • •

Some types of research cannot be carried out in a block period but must be continued all year.

• • •

We use the block system in order to make the greatest use of our facilities. I am not persuaded that it is the best method. It prevents any coordination of biochemistry and physiology with anatomy. I am persuaded that the students would profit by having some knowledge of these other subjects while they study anatomy.

• • •

Responses favoring block time teaching

In my experience the students in gross anatomy have done better under block time due to the direct continuity of the course. When run concurrently with other courses a careful consideration of the curriculum is required. Here students are taking gross, neuro, biochemistry and bacteriology simultaneously, making for too heavy a load.

• • •

On the block system the student is able to concentrate his efforts to a limited field and the instructors have more free time for other activities. *However*, regardless of the number of teaching hours, the period of time during which a course is taught cannot be reduced too much—the student needs a certain period to digest and organize his facts.

• • •

Greater facility in over-all concept of a region. Unified thinking by student. Opportunity of more concentrated research and writing for members of faculty.

• • •

To student: no extraneous material to shift attention; better psychologic approach; to staff: more time for continuous research; enhances spirit of teaching; holds attention of teacher to student.

• • •

Students study for one exam after the other, thus finding themselves in a complete whirl when all courses run concurrently. Block system allows concentration on part of student. Staff greatly aided by block time.

• • •

Allows time to fulfill our other obligation—namely, that of contributing our new knowledge through research. It is difficult to do good research with an hour or two at a time at scattered intervals throughout a long teaching period.

• • •

Less confusion and inter-departmental competition for students' time. Offers better correlation and integration by staff of Anatomy subjects; and provides faculty with a block of time to pursue research without teaching obligations.

• • •

Block time allows more efficient use of teaching and learning time and energies—and ditto for research. However, the concurrent scheme allows more efficient integration with other subjects.

• • •

To staff: clear time left over for research. To students: if functionally taught anatomy is a foundation for basic medical sciences as well as for clinical subjects: it is useful to grasp it as a *whole*.

• • •

Students—Better and more rapid adjustment to their new environment, better intuitive familiarity with anatomy.

Staff—Teaching period short work[s] for retention of enthusiasm and thoughtfulness; greater freedom and leisure for research.

• • •

Permits students to concentrate their efforts on one subject; eliminates impression that various courses compete for student time; prevents see-saw study for alternating exams; permits concentrated teaching at one time and concentrated research at other times.

• • •

Prevents or reduces usual psychological "let down" by students.

Affords staff more time for research and planning.

Enables students to concentrate energies.

• • •

The staff fulfills all their teaching obligations in one semester. However, the complete adjustment of the student to medical school comes out of anatomy time. Unless extreme care is taken to hasten this adjustment some students will find that the anatomy course is at least half over before they begin to find themselves. If they make the adjustment quickly enough they then have a good background for physiology and biochemistry.

• • •

Advantages—Strongly favored by students; provides staff with large segment of free time for research.

Disadvantages — Students should have more contact with other departments during first half of first year; Anatomy not as natural a "bridge" as Biochemistry for transition to Medical Study. Staff, especially senior staff, because of other responsibilities, often find it difficult to make adequate preparation for effective instruction of students.

• • •

The block time as applied to anatomy provides a far more efficient opportunity for correlation of the several fields of anatomy than otherwise provided. Secondly, the students seem to respond with favor to the concentrated study of one general subject as contrasted with spreading the material over a much longer period of time. There is an obvious advantage to the staff in that they can concentrate on teaching for a period of a few months with the balance of the time devoted to research and other activities.

• • •

This is by a bare majority of the staff. For staff: Better chance to concentrate on research for remainder of year. For student: (1) can learn more readily if not thinking about too wide a field at one time as is so when material which is not actively related is being studied at the same time; (2) the competition for time which is present under the other system is lacking. A problem especially at times of examinations in other courses.

• • •

Students gain through concentration on two concurrent courses (Gross and the companion subject, Histology, Embryology, or Neuroanatomy), as opposed to spreading their efforts on three or more courses. Staff gains by having a semester during which full time can be devoted to research.

• • •

Gross: The cadavers are best if used at once. The time of students is more effectively used (less overhead). The time of the staff is conserved. Our present schedule with four courses during the first semester of the first year gives sufficient variation in subject matter.

• • •

No interference, can better use own judgment and mold the course as it progresses.

• • •

Staff—Free block time for research, therefore more inclination to concentrate on teaching during teaching block.

Students—Concentration on limited subject matter. Obviates competition between courses.

• • •

Responses indicating no preference

Both have advantages. Concurrent teaching makes correlation easier, spreads study and allows time for assimilation; block teaching limits teaching time to a definite point in the calendar: allowing concentrated intensive student attention.

• • •

I think that either method with good teachers will do the job. I favor an introductory course in freshman year (three quarters) and special work in later years.

TABLE A.15
FREE-RESPONSE COMMENTS ON TEXTBOOK DEFICIENCIES
(Participants group)

Gross texts are either too detailed or the briefer ones do not cover certain areas adequately. The neuro texts meet our needs better but [are] too detailed for the number of hours available to the course.

• • •

Reading material is not sufficiently interesting to compel students to read—especially true in neuro and gross anatomy.

• • •

Existing gross anatomy texts are all of a reference type. A readable book is needed—somewhat like Grant's but more so. Histology texts are somewhat better; that of Cowdry is excellent. There is need of a text which presents basic information about nervous system (anatomy, physiology, etc.) in a coordinated manner.

• • •

(I teach gross). No textbook is written for freshmen; they are reference texts for practitioners or specialists. The student is incapable of picking detail where it is needed, hence, he gets lost. Illustrations of easy conceptual material are abundant. Illustrations of things obscure are lacking. Illustrations involving function are lacking. In revisions there is not enough complete rewriting.

• • •

In my opinion there is still a need for a text in a reasonable price range which combines a practical regional approach with sufficient systematic treatment. Further, in my opinion, although there are several satisfactory systematic texts, there is not one good regional text. Deficiencies:

1—Regional texts generally require the use and purchase of a systematic text as a source and supplement.
2—Because of descriptive inadequacies for a systematic review.
3—Lack of attention to significant features of clinical, or practical importance in most regions.

• • •

The proper text for gross anatomy for medical students has never been written. We teach course regionally and adequate texts are systemic. Text should be a good combination of regional and systemic description. The descriptions should be reduced in volume. For example, the descriptions of osteology are much too detailed; the wordage on muscles could be reduced. Then there is the usual cry to omit embryology, C.N.S., and histology.

• • •

Existing textbooks are great storehouses of information, but are not arranged so as to be helpful to the beginning student of anatomy. Too much time is spent in searching for specific information.

• • •

Books do not fit needs if used for texts instead of references. Details exceed those warranted when courses have only a small amount of time. For example, future plans allot only 230 hours to gross anatomy.

• • •

Require an equal distribution of the three

standard American textbooks in gross anatomy. Recommend and urge students to acquire atlases and regional anatomy books. Existing texts fit our needs. Histology texts could be improved by more functional approach.

• • •

We need a concise anatomy text for simultaneous study of the living body and the cadaver.

• • •

The course in human anatomy as given here is an integrated and unified one. There are no textbooks in English which present anatomy adequately from this point of view. Hence, students are required to refer to four separate textbooks (gross anatomy, embryology, histology and neuroanatomy).

• • •

Available gross anatomy texts are much too long for the time available. We need a realistic gross text to fit the present day anatomy courses.

• • •

Needs are filled rather well. I feel that no author has room to express all sides on controversial material. Therefore, we lecture on that phase of the subjects.

• • •

Histology—some are voluminous and detailed, others are easier to read but less well presented; some are spotty in their emphasis. Gross anatomy, neuroanatomy and embryology have satisfactory texts.

• • •

Gross texts would be improved by removal of material not used: A really good accurate regional text would be highly valuable in teaching gross anatomy on a curtailed schedule.

• • •

(My course is neuroanatomy.) None of them give succinct statements of functions of the neurological systems, or even specific structure. They are too *descriptive*.

• • •

Textbooks of gross anatomy are too encyclopedic in scope, covering too many details—e.g., in the fields of skeletal and articular anatomy, and discussing topics that nobody looks for in a gross anatomy text, e.g., embryology, histology, anatomy of central nervous system. Illustrations are often stale and discussions uninspired. There is need for correlation with function and clinical phenomena. Anatomical concepts and principles should be broadly discussed and integrated with the body of the presentation.

• • •

It's probably impossible to suit everyone. If, however, more of our numerous available textbooks are at least acceptable to a teacher of anatomy, he's rapidly reaching the point at which everyone but him is out of step!

• • •

Inadequate coverage of the more important points and too adequate coverage of less important things; errors.

• • •

A good regional text is needed.

• • •

We need a gross anatomy that is more concise, with a regional approach. A text in gross anatomy may well omit details of the central nervous system as well as the microscopic aspect.

• • •

Textbooks are deficient in presentation and coverage of subject matter and may include uneessential material. The advantages of using textbooks, however, outweigh the disadvantages of not using them.

• • •

In general, not adequate, however, this is chiefly because of differences in approach. In a few instances where the approach is acceptable, the factual material is inadequate or too difficult to locate.

• • •

The large gross anatomies are too detailed, and are not physiologic enough. The neurology texts are too detailed for undergraduate students.

• • •

The adequate texts are too general in their treatment of some subject areas and too detailed in others. Our staff members seem to agree on this matter, in general, but differ when it comes to being specific.

• • •

Gross anatomy: Too cadaveric, too detailed, too far removed from modern clinical requirements and medical science approach. (I am writing a new text at present.)

Embryology: A small and not too detailed book applied more directly to human embryology is much needed. It is desirable that it contain short correlative reviews of the other systems preceding the system under discussion.

• • •

Textbooks in anatomy and histology fill needs. In embryology a brief, well illustrated textbook would be useful.

• • •

In general yes. Texts are all tending to overelaboration and overillustration and are too expensive in consequence.

• • •

The standard textbooks for medical students are too detailed; those for nonmedical students are not detailed enough. It is particularly difficult to find textbooks suitable for an "integrated" course in anatomy.

• • •

Existing texts have two great faults.
Gross anatomy: (1) too large and unwieldy,
(2) fail to give emphasis where it is needed, and so important and unimportant facts receive equal recognition and treatment.
Existing texts in histology—excellent.
Neuroanatomy—adequate.
Embryology texts—unsuitable.

• • •

(a) There is no text of gross anatomy suitable for the reduced content of the modern course. Grant's method and my "Visual Anatomy" come closest but neither of these is specifically designed to fit this need.

(b) Most texts of neuroanatomy and embryology are entirely unrealistic in that their volume is out of line with the amount of time devoted to these subjects.

(c) Histology texts are good.

(d) No satisfactory text integrating anatomy as a whole has yet been prepared (to my knowledge).

TABLE A.16

FREE-RESPONSE COMMENTS: SOLVING PROBLEMS OF INADEQUATE CADAVER SUPPLY

(Participants group)

As active member of the State Anatomical Board I keep constantly in touch with State Penal and Psychiatric Institutions and each year contact all County Health Officers and County Coroners. In the larger Counties this is done by direct visits to the officers, in smaller Counties only by correspondence. When I came here in 1947, we used twice as many cadavers as we

received, now we have available at least twice as many as we need.

• • •

California state law permits willing of body to medical school. Through two news releases and via University Publicity Office, one three years ago and one this year, we now have 400 people on the list who have willed their bodies and to date a total of 90 bodies have been received.

• • •

In Chicago, the five medical schools secure cadavers through the Demonstrators Association —a nonprofit organization with each school represented. They own a building, employ two graduate embalmers, and own a truck. Bodies are secured from the Cook County Hospital and Oak Forest Old Peoples Home. While the present supply is somewhat short, we have always been able to get what we need for class work although in some the preservation is unsatisfactory. The cost per cadaver is about $75, part of which is used to pay for the new building and will be reduced to about $55 when the building is paid for.

• • •

A committee of anatomists, representing medical and dental schools in New York State, has been established to consider means to assure an adequate supply of cadavers. Most of the members of this committee are hesitant to recommend establishment of what they consider proper procedures, since this would require legislative action and might arouse unwanted controversy. Because of (1) additional requirements for cadavers, such as result from expansion of the student body of this school and the opening of a medical school by Yeshiva University, and (2) the apparently dwindling supply of cadavers, the legal counsel of State University of New York is studying steps which may be recommended in the future.

• • •

Visitations made on the medical directors of state hospitals. Speeches before undertakers' conventions and stories in their publications. Encouragement of donors and careful and complete attention to enquiries. All efforts have yielded results and total effort of working at problem can be very rewarding.

• • •

Personal contacts and conferences with many superintendents and directors of Ohio's mental institutions, from which our main supply is derived, have greatly increased our supply. Many of these officers claimed they were unaware of the critical shortage of dissection material. Moreover arrangements have been made to report back to these officers any pathology and abnormalities found in the cadavers obtained from their institutions, thus satisfying their chief reason for having autopsied many unclaimed bodies, previously.

• • •

In Pennsylvania the cadaver situation is controlled by an adequate and enlightened set of state laws which place all unclaimed dead bodies, with certain exceptions, in the hands of the State Anatomical Board, an official state organization, made up of all professors of anatomy in all medical schools of the state plus some others. The Board distributes the bodies received to the various medical schools in accordance with the needs of each school as determined from the enrollments. No other efforts than those of the Anatomical Board are necessary in this state.

• • •

A recent revision of the anatomical law makes release of the unclaimed dead mandatory. Since the revision the flow of material has increased significantly.

• • •

The State of Virginia has a satisfactory code and if the laws are properly enforced, they afford adequate anatomical material. In 1948 the State Anatomical Board, an independent agency, was placed under the jurisdiction of the State Board of Health, Chief Medical Examiner. Since that time the supply of cadavers has increased.

• • •

a. By keeping a constant check on the Deputy-Morgue Custodian.
b. By establishing good rapport with the County Medical Director.
c. Great care is exercised to keep an accurate accounting of the Roman Catholic bodies. After dissections have been completed, a prominent Catholic physician is contacted, who in turn makes the necessary arrangements through the Chancery of the Diocese of Buffalo for burial in consecrated ground.
d. Active participation on the New York Anatomical Committee has helped keep us alert to trends in proposed legislation.
e. We have constantly used the offices of the University lawyers to handle local problems.
f. A form letter is used for persons expressing a desire to will their body to the University for scientific purposes. This letter outlines the necessary legal steps which should be taken.

With all the above steps, we are just about breaking even on the supply of cadavers for dental and medical students. If necessary, we will assign 6-8 dental students per cadaver instead of 4.

• • •

We have been able to obtain the complete cooperation of the authorities at the State Hospital. We pay a secretary there to look after our interests. We receive 50 per cent of our bodies free. The other 50 per cent are obtained by an offer of $50 per body to the nearest relative. We are guided in this by the secretary at the State Hospital. Prior to this arrangement our supply was inadequate.

• • •

Encourage people to will their bodies—this has resulted in a yearly increase of "willed bodies" that come to our Anatomical Board. Frank discussion of cadaver shortage with religious groups opposed to anatomical dissection. Talks have been made to our mutual appreciation of problems, but to date such discussions have not resulted in more specimens for scientific study.

• • •

Increased compensation for the embalming and transportation of bodies. The *efforts* have been effective.

• • •

Try to establish good relations with various state institutions and coroners. Some institutions respond well—others minimally. Number of cadavers depends on (1) interest of pathologist at institution, (2) religion of superintendent, (3) interest of administrators in the medical school.

(a) Periodically we approach the provincial department of health, and
(b) circularise the superintendents of the poor law hospitals and institutions throughout the province.
(c) Contact the secretary of the provincial morticians association.

Comments on above:

The upswing in returns is slow. We are very much under the thumbs of the morticians who appear to carry much weight politically. They even dictate what will be done at autopsies!

• • •

TABLE A.17

FACULTY TIME DISTRIBUTION: TEACHING AND STUDENT CONTACT
(Faculty group)

	Lectures			Conferences			Laboratory			Examinations		
	N	Range no. hrs.	Median no. hrs.	N	Range no. hrs.	Median no. hrs.	N	Range no. hrs.	Median no. hrs.	N	Range no. hrs.	Median no. hrs.
All Faculty N=487												
Required courses												
1. Gross anatomy	(222)	1–160	25	(100)	2–150	20	(253)	10–999	238	(233)	10– 90	14
2. Histology	(204)	1–120	20	(70)	1–220	11	(213)	2–476	105	(171)	2–150	10
3. Neuroanatomy	(150)	1– 81	20	(64)	1– 50	8	(207)	7–224	64	(148)	1– 72	6
4. Combination course(s)	(94)	1–151	22	(40)	2– 70	11	(87)	3–600	60	(81)	1– 80	8
Electives (combined)	(97)	1–134	18	(58)	2–864*	21	(94)	4–420	40	(52)	1– 42	4
Additional student contact (unscheduled)				(313)	1–700	38						
Chairmen N=75												
Required courses												
1. Gross anatomy	(43)	2–129	26	(21)	2–150	28	(42)	20–440	234	(39)	4–80	15
2. Histology	(38)	2– 68	18	(16)	2– 60	11	(35)	18–250	101	(28)	2–80	9
3. Neuroanatomy	(27)	1– 41	22	(10)	2– 24	9	(28)	16–150	60	(21)	2–12	7
4. Combination course(s)	(18)	6–140	30	(5)	2– 53	12	(15)	4–600	49	(14)	2–80	7
Electives (combined)	(16)	2–120	10	(12)	10– 50	30	(15)	5–380	48	(5)	3–38	7
Additional student contact (unscheduled)				(48)	10–300	50						
Professors N=76]												
Required courses												
1. Gross anatomy	(30)	1–132	34	(15)	6– 60	22	(31)	66–480	240	(28)	4–80	17
2. Histology	(30)	2– 81	26	(12)	5–144	12	(34)	30–340	107	(21)	6–40	11
3. Neuroanatomy	(24)	2– 81	22	(7)	3– 20	11	(28)	20–140	65	(15)	4–25	6
4. Combination course(s)	(20)	2– 93	20	(5)	4– 50	5	(15)	4–447	50	(11)	1–36	10
Electives (combined)	(17)	6–100	22	(11)	12–864*	50	(13)	12–404	72	(10)	2– 6	4
Additional student contact (unscheduled)				(48)	4–275	50						
Associate professors N=116												
Required courses												
1. Gross anatomy	(41)	1–123	26	(17)	3–120	23	(50)	10–714	221	(46)	2–90	12
2. Histology	(48)	1–108	21	(13)	1–120	10	(52)	12–350	120	(43)	2–35	9
3. Neuroanatomy	(39)	1– 52	24	(19)	2– 50	8	(54)	15–224	64	(41)	1–26	6
4. Combination course(s)	(22)	1–130	25	(10)	3– 50	22	(22)	14–455	60	(18)	1–30	5
Electives (combined)	(24)	6–134	19	(16)	3–523	20	(28)	4–420	40	(17)	1–32	5
Additional student contact (unscheduled)				(78)	1–380	39						
Assistant professors N=116												
Required courses												
1. Gross anatomy	(56)	1–130	22	(28)	5– 70	20	(67)	10–600	255	(59)	2–70	12
2. Histology	(50)	2– 96	20	(16)	1–220	15	(52)	6–357	105	(44)	2–36	10
3. Neuroanatomy	(36)	1– 60	18	(14)	1– 30	6	(54)	7–186	60	(38)	1–20	6
4. Combination course(s)	(22)	1–151	16	(10)	4– 60	8	(20)	3–435	54	(16)	2–29	11
Electives (combined)	(22)	2–115	17	(11)	2– 65	20	(20)	6–344	31	(10)	1–20	7
Additional student contact (unscheduled)				(79)	3–700	30						

(Table continued on page 127)

TABLE A.17 (continued)
FACULTY TIME DISTRIBUTION: TEACHING AND STUDENT CONTACT
(Faculty group)

Other† N = 104												
Required courses												
1. Gross anatomy	(52)	1–160	17	(19)	3– 60	15	(63)	31–999	243	(61)	2– 72	14
2. Histology	(38)	1–120	38	(13)	2– 44	5	(40)	2–476	117	(35)	2–150	10
3. Neuroanatomy	(24)	1–100	12	(14)	2– 20	9	(43)	22–198	66	(33)	1– 72	6
4. Combination course(s)	(12)	1– 70	12	(10)	3– 70	10	(15)	11–420	63	(15)	1– 18	7
Electives (combined)	(18)	1– 81	14	(8)	4–156	16	(18)	6–150	36	(10)	2– 42	4
Additional student contact (unscheduled)				(66)	5–300	30						

*Upper limit estimated on basis of 36-week year from response of one faculty member who indicated he spent as many as 24 hours per week in this activity.
†Associates, fellows, lecturers, instructors, assistants.

TABLE A.18

COURSES IN OTHER DEPARTMENTS TAUGHT BY MEMBERS OF THE DEPARTMENT OF ANATOMY

(Chairmen group; multiple response)

Course	Number of departments*†
Neurology	7
Pediatrics	7
Physiology	6
Endocrinology	5
Obstetrics	4
Surgery	4
Medicine	3
Neurophysiology	3
Oncology	3
Radiology	3
Biology	2
Hematology	2
Many topics and fields	2
Neuropathology	2
Neurosurgery	2
Orthopedics	2
Pathology	2
Psychiatry	2
One each of the following:	16
Anthropology, bone anatomy for E.N.T., clinico-pathology conferences, functional anatomy for orthopedics, growth and change, human anatomy for physical education, interdepartmental clinics, medical physics, ophthalmology, orthopedic surgery, otolaryngology, parasitology, physiology of endocrines, plastic surgery, post-graduate courses, various residency programs	

*No response = 57
Total N = 90

TABLE A.19

FREE-RESPONSE COMMENTS ON ANATOMY TEACHING BY MEMBERS OF OTHER DEPARTMENTS

(Chairmen group; multiple response)

Response	Number of departments*
1. *Responses indicating existing situation*	
Special lectures are given by members of clinical departments	17
Clinical departments conduct correlation clinics	9
Radiologists help teach radiological anatomy	5
Patient demonstrations are given	4
Specialists help teach regular courses	3
Surgeons teach or help teach gross anatomy	3
Clinical conferences and demonstrations are held	2
Some staff members invite lecturers	2
Surgeons teach applied anatomy	2
The x-ray department gives a series of lectures	2
Pathologists teach histology	1
2. *Responses evaluating such teaching*	
Clinical applications and/or demonstrations are desirable	6
The experience has been highly satisfactory	2
The experience has been satisfactory but not entirely so	2
Generally, the interest of members of other departments is restricted	1
Such participation enhances the interest of lectures	1
Other	2

*No response = 33
Total N = 90

TABLE A.20

DEPARTMENTAL AFFILIATIONS OF ANATOMY TEACHERS FROM OTHER DEPARTMENTS
(Chairmen group; multiple response)

Departmental affiliation of teacher	Anatomy course taught and frequency of listing										% of chairmen listing courses taught by department at left
	Gross anat.	Neuro-anat.	Histology	Embryology	Applied anatomy	Surgical anatomy	Clinical anatomy	Neurosurgery	Radiological anatomy	Other	
Surgery	23	0	0	0	8	5	1	0	0	4	68
Radiology	15	2	0	0	2	0	1	0	5	2	45
Neurology	3	13	0	0	0	0	0	1	0	2	32
Medicine	4	1	3	1	2	0	0	1	0	2	23
Physiology	1	2	2	0	0	0	0	1	0	2	13
Obstetrics and gynecology	3	0	1	0	1	0	1	0	0	1	12
Orthopedics	2	0	0	0	1	0	1	0	0	2	10
Pathology	2	0	3	0	1	0	0	0	0	0	10
Ophthalmology	3	0	0	0	0	0	1	0	0	1	8
Otolaryngology	3	0	0	0	0	0	1	0	0	1	8
Urology	1	0	0	0	1	0	1	0	0	2	8
Orthopedic surgery	2	0	1	1	0	0	0	0	0	0	7
Anesthesiology	1	0	0	0	0	0	0	0	0	2	5
Dentistry	1	0	2	0	0	0	0	0	0	0	5
Physical medicine	2	0	0	0	0	0	0	0	0	1	5
Psychology	0	1	0	0	0	0	0	0	0	2	5
Biochemistry	0	0	2	0	0	0	0	0	0	0	3
Cardiology	1	0	0	0	1	0	0	0	0	0	3
Clinics	1	1	0	0	0	0	0	0	0	0	3
Neuropsychiatry	0	2	0	0	0	0	0	0	0	0	3
Oncology	0	0	1	0	1	0	0	0	0	0	3
Pediatrics	1	0	0	0	1	0	0	0	0	0	3
Other*	4	0	1	0	0	0	1	0	0	3	15
Department not specified	1	0	1	0	0	0	0	0	0	0	3
N (Number of chairmen responding to this question)											(60)
No response (% of total N =65)†											6

*Other departments listed with a frequency of one: Dermatology, Hematopathology, Human growth, Hospital, Medical surgery, Otology, Surgical specialties, Surgery and radiology, Zoology.

†Total N = number of chairmen reporting that members of other departments participate in teaching anatomy courses.

TABLE A.21

FIELDS OF SPECIALIZATION: MEDICAL SCHOOL GRADUATES (1940-50)

(Graduate group)

Specialty	*Number*	*Per cent*
General practice	97	15
General surgery	66	10
Psychiatry, neurology, neuropsychiatry	62	9
Otolaryngology	59	9
Pediatrics	56	8
Orthopedic surgery	55	8
Radiology	55	8
Obstetrics and gynecology	54	8
Urology	52	8
Neurosurgery	49	7
Thoracic and cardiovascular surgery	47	7
Internal medicine	15	2
Other	3	1
TOTAL	670	100

TABLE A.22

ATTITUDES TOWARD ADEQUACY OF THIRD AND FOURTH YEAR ANATOMY INSTRUCTION

(Graduate group)

(*Question*: In retrospect, do you think you should have had more or less advanced instruction during the third and fourth undergraduate years?)

Specialty of respondent	% Response*			Total N = 670		% Response*			Total N = 670	
	More	Less	No change	Responding N	% no response	More	Less	No change	Responding N	% no response
	Gross Anatomy					Histology				
General practice	65	0	35	(99)	1	22	2	76	(85)	12
Obstetrics and gynecology	72	0	28	(53)	2	39	8	53	(51)	6
Otolaryngology	67	2	31	(58)	2	28	2	70	(57)	3
Pediatrics	38	6	56	(55)	2	29	6	65	(49)	12
Psychiatry	29	2	69	(58)	6	19	0	81	(54)	13
Radiology	61	0	39	(51)	7	19	4	77	(48)	13
Surgery	74	†	25	(212)	2	23	3	74	(184)	15
Urology	62	0	38	(50)	4	21	4	75	(48)	8
Others	28	0	72	(18)	0	25	0	75	(16)	11
Average	62	1	37	(651)	3	24	4	72	(592)	12
	Embryology					Neuroanatomy				
General practice	16	5	79	(85)	12	52	4	44	(91)	6
Obstetrics and gynecology	36	8	56	(48)	11	13	7	80	(45)	17
Otolaryngology	23	2	75	(56)	5	43	2	55	(56)	5
Pediatrics	44	2	54	(52)	7	52	4	44	(52)	7
Psychiatry	7	4	89	(53)	15	52	2	46	(59)	5
Radiology	26	4	70	(46)	16	60	0	40	(47)	15
Surgery	26	5	69	(188)	13	39	3	58	(189)	13
Urology	26	6	68	(47)	10	13	4	83	(47)	10
Others	12	0	88	(16)	11	47	0	53	(17)	6
Average	25	4	71	(591)	12	42	3	55	(603)	10

*The distribution of responses is independent of the respondents' having taken advanced courses in these areas, and of their having responsibility for anatomical teaching.

†Less than 1% response.

TABLE A.23

RECOMMENDATIONS FOR RESIDENT OR POSTDOCTORAL ANATOMY TRAINING

(Graduate group)

Group	Responding N	Is training recommended?								
		In organized courses			In supervised dissection, study of slides, etc.			Personal study (opportunity, materials, etc.)		
		Yes %	No %	No response %	Yes %	No %	No response %	Yes %	No %	No response %
Specialty										
General practice	(97)	63	23	14	70	20	10	75	16	9
Obstetrics and gynecology	(54)	68	17	15	83	9	8	80	7	13
Otolaryngology	(59)	81	12	7	90	10	0	92	3	5
Pediatrics	(56)	27	48	25	39	41	20	63	23	14
Psychiatry	(62)	65	24	11	69	18	13	84	10	6
Radiology	(55)	53	25	22	40	27	33	80	11	9
Surgery	(217)	70	16	14	78	8	14	91	2	7
Urology	(52)	67	21	12	79	11	10	92	4	4
Others	(18)	22	61	17	61	33	6	72	22	6
Total	(670)	63	22	15	71	16	13	84	8	8
Teaching responsibility										
Responsible for teaching	(172)	70	19	11	77	11	12	91	5	4
No teaching responsibility	(490)	60	24	16	68	19	13	81	10	9
Total	(670)*	63	22	15	71	16	13	84	8	8

*Includes eight respondents who failed to indicate whether or not they had teaching responsibilities. The column of total percentages includes their responses.

TABLE A.24

DESCRIPTION OF MEDICAL SCHOOL GRADUATES GROUP (1939-51)
(Graduates group)

Item describing graduates	Number	Per cent
Year of graduation		
Year of graduation		
1939	7	1
1940	54	8
1941	53	8
1942	68	10
1943	154	23
1944	85	13
1945	74	11
1946	64	10
1947	40	6
1948	33	5
1949	13	2
1950	24	3
1951	1	0
Total	670	100
Type of school attended		
Support		
Tax-supported	297	44
Private	367	55
Unknown	6	1
Total	670	100
Experience in practice		
Years in practice		
None	7	1
Less than: 2	17	3
4	84	12
6	148	22
8	164	25
10	139	21
12	69	10
14	37	6
16	5	1
Total	670	100

TABLE A.25

YEARS OF INTERNSHIP AND RESIDENCY OF GRADUATES GROUP
(Graduates group)

Specialty field of graduates	No. of grads. with given years of internship & residency									Median no. years experience	Total N of graduates
	Less than this many years:								8 yrs. or more		
	1	2	3	4	5	6	7	8			
General practice	1	63	27	3	2	1	0	0	0	1.8	(97)
Obstetrics and gynecology	0	1	1	5	28	13	4	1	1	4.7	(54)
Otolaryngology	0	1	1	12	24	15	6	0	0	4.7	(59)
Pediatrics	0	1	2	35	11	6	1	0	0	3.7	(56)
Psychiatry	0	1	0	8	33	14	2	3	1	4.7	(62)
Radiology	0	0	2	5	30	12	6	0	0	4.7	(55)
Surgery											
General	0	0	2	1	11	20	24	7	1	6.0	(66)
Neurosurgery	0	0	0	0	7	16	10	9	7	6.2	(49)
Orthopedic	0	1	2	4	17	20	6	5	0	5.2	(55)
Thoracic and cardiovascular	0	1	0	0	4	10	19	9	4	6.5	(47)
Urology	0	0	0	3	22	16	7	1	3	5.1	(52)
Others	0	0	1	2	10	4	1	0	0	4.6	(18)
Total	1	69	38	78	199	147	86	35	17	4.8	(670)

Appendix D Anthropology in Medical Education*

1. Anthropology as an Ancillary Medical Science

WILLIAM WALTER GREULICH, *Professor of Anatomy, Stanford University School of Medicine*

The relationship between physical anthropology and medicine has, in the past, been a very close and mutually profitable one. Indeed, most of the early physical anthropologists, both in this country and in Europe, had been trained in medicine, and many of them combined a career of medical teaching with productive anthropological research. I should like to mention very briefly the names and the contributions of a few of those men who played a prominent role in the early development of physical anthropology in this country.

Dr. Samuel G. Morton of Philadelphia, who is usually considered to be the founder of physical anthropology in the United States, graduated in medicine from the University of Pennsylvania in 1820, and from Edinburgh three years later. In 1826 he began to practice medicine in Philadelphia and, in the fashion of that day, gave private instruction in anatomy and medicine to medical students. Morton's principal anthropological interest was racial differences in the human skull. His monumental work on that subject, *Crania Americana*, was published in 1839, the same year in which he was appointed professor of anatomy at the University of Pennsylvania.

Two other early Philadelphia medical school teachers who contributed to the development of physical anthropology in this country were Dr. Joseph Leidy (1823-91) and Dr. J. Aitken Meigs (1829-79). Leidy was Curator of the Academy of Natural Sciences in Philadelphia and also occupied the chair of anatomy at the University of Pennsylvania. Though Leidy's interests were very broad, encompassing as they did archeology, paleontology, and natural history, several of his important publications were in the field of physical anthropology.

Dr. Meigs, who continued and extended Morton's comparative studies of human crania, occupied not a chair but what might more accurately be called an academic settee, since he was professor of climatology, physiology, and what was then called the "Institutes of Medicine" in several Philadelphia medical colleges.

Boston, too, had its early medical anthropologists. There is time here to mention only two of them, Dr. Jefferies Wyman and Dr. Henry F. Bowditch.

Wyman graduated in medicine at Harvard in 1837. One of his biographers relates that, because Wyman at first found difficulty in securing a favorable opportunity for practice, he became demonstrator in anatomy at Harvard College; but his earnings there were so small that, in order to eke out his subsistence, he was obliged at the same time to become a member of the Boston Fire Department. This testifies not only to Wyman's versatility and resourcefulness, but also to the immutability of the salary scale of junior teachers of anatomy in this country. In 1847, Wyman succeeded Dr. Warren as Hersey Professor of Anatomy at Harvard and, in 1866, Wyman was appointed the first Curator of the Peabody Museum of American Archeology and Ethnology in Boston.

Wyman's contributions to physical anthropology include the first precise osteological description of the gorilla, several important papers on the human crania in the collection of the Peabody Museum, anatomical studies of the Hottentot and, in contrast, a detailed anthropometric investigation of the brain and cranium of Daniel Webster, in whose autopsy he had participated. At the time of his death, Wyman was recognized as the leading anthropologist of the United States.

Another member of the Harvard medical faculty of the 19th century who had important anthropological interests was Henry P. Bowditch (1840-1911), the professor of physiology. In the early 1870's, under the auspices of the Health Department of the Social Science Association of Boston, Bowditch began his classic studies of the growth of children. His stated objection was "to determine the rate of growth of the human race under the conditions which Boston presented." Bowditch's investigations were the first in that field in this country and they gave impetus to most of the subsequent American growth studies.

An active interest in child growth and development has continued at Harvard to the present day. The well-known investigations made about 25 years ago by Dr. Walter F. Dearborn, of the school of education, and the current, very comprehensive, longitudinal study directed by Dr. Harold Stuart, of the school of public health—in which the growth and development of in-

*The following three talks, herewith reprinted in full, were delivered at the panel presentation, Anthropology in Medical Education (see Chapter II), presided over by Dr. William L. Straus.

dividual children have been followed at successive examinations over a period of more than 20 years—are worthy extensions of Bowditch's pioneer work.

It is reasonable to assume that the anthropological interests of the early medical teachers were reflected in their lectures and that their students carried away with them a greater awareness of, and interest in, anthropology than do most medical students today, for in recent years there has been a progressive loss of contact between medicine and anthropology, which has operated, I believe, to the disadvantage of both fields. This is especially regrettable because anthropology now has more to offer that is of interest and utility to medicine than ever before. Let us consider briefly a few of the areas in which the interests of these two sciences impinge.

Anatomy has been defined as including any kind of investigation that anatomists care to undertake. That the realm of anthropology is even broader is suggested by the following limerick, which is attributed to the economist, Kenneth Budding:

"The whole vast perspective of man
Is what anthropologists scan,
So the net that they take
Is as big as the lake;
Let the fish get away if they can."

This applies, perhaps, even more to physical anthropology than to the other divisions of that science, for, during the past half century, it has greatly expanded its domain through the use of tools and techniques borrowed from other disciplines and applied effectively toward the solution of problems which are properly its own. Thus, in addition to its evolutionary and other more traditional subject matter, physical anthropology has come to include such subjects as prenatal and postnatal growth and development; normal and abnormal human variations; human genetics, especially the mode of transmission of heritable traits which serve to throw light upon individual and group relationships (e.g., eye color, hair form, and blood groups); palmar and plantar dermatoglyphics; constitution and constitutional types; ageing, etc. In short, physical anthropology now embraces most of the content of the larger field of human biology.

Though the application of these segments of physical anthropology to medicine is obvious, many of them fall on the borderline or somewhere between the traditional subjects of the medical curriculum. As a result, they are often either entirely neglected or dealt with quite inadequately by the medical faculty. The amount of attention devoted to physical growth and development of children, for example, is frequently determined by the interest in the subject—or lack of it—among the staff of the department of pediatrics. Other aspects of physical anthropology are likely to receive the same haphazard attention.

There are many areas of medicine in which information from cultural anthropology, too, is very helpful. An example is geographic pathology, which concerns itself, among other things, with significant differences in the incidence of various diseases in different races and among different groups of the same race in different parts of the world. The full significance of some of the findings of the geographic pathologist can be seen only in the light of traditional anthropological data.

If, for example, it is found that cancer of the breast is significantly higher in one racial or regional group than in another, it is essential to know if there are any differences in the cultural patterns of the two groups which might possibly favor the development of such malignancies. These might include differences in the degree of marital consanguinity prescribed or tolerated by the culture, in the pattern of nursing, in the age of weaning, in the way in which the nursling is dealt with if, before it is weaned, the mother conceives again, etc. In brief, the literature of social anthropology, which contains such information, can often help those interested in medical problems of this kind, by providing them with additional relevant data or by directing their attention to aspects of the matter which had previously escaped their notice. The medical student should be made aware of the existence of this branch of anthropology and of some of the ways in which it can serve medical science.

A familiarity with some anthropological concepts of the past can also be helpful to the medical student, since it will enable him to appraise more critically similar medical and other scientific theories which are currently in vogue or which he will later encounter in his professional career. Permit me to give you an example of what I have in mind.

Each year, when our students are beginning to dissect the head and neck and have also got well into their work in neuroanatomy, I take a few minutes of their time to tell them something about phrenology, a cult which flourished, both here and in Europe, during the first half of the 19th century. Phrenology purported to enable those familiar with its techniques to determine one's character and personality traits by studying the external configuration

of his head.

Despite its fallacies and the charlatanism of some of its practitioners, phrenology did much to stimulate sound and productive studies of the structure of the human brain. It is, therefore, a good example of a concept which, though quite unsound itself, was indirectly responsible for some very important advances in human knowledge. Both the medical student and his teacher might find some reassurance in thus being reminded that a significant advance in medical science can occasionally occur as an indirect result of the faulty reasoning of quite ordinary men and women. The uncritical enthusiasm with which the claims of phrenology were accepted by many of the leading medical and other professional men of that period should help to convince the student that professional eminence does not confer infallibility of judgment, and that his teachers and even he, himself, share the same limitation.

There is another useful lesson to be drawn from the history of phrenology. From time immemorial, man has striven to discover some external bodily feature or features which are associated with specific character traits with sufficient regularity to enable one, by means of them, to appraise the character and personality of another. Phrenology was merely one of many attempts that have been made to achieve this objective. It failed and, for all practical purposes, has faded from the scene, but the search for what it claimed to provide still goes on.

This perennial quest is, perhaps, best represented today by Sheldon's doctrine of the varieties of human physique and their psychological and other concomitants. Like phrenology, this doctrine attempts to relate temperament and personality to certain externally discernible bodily characters. As was also the case with phrenology in its palmy days, Sheldon's formulation has been accepted by many people competent to evaluate it, rejected by others who are quite as competent, and accorded very enthusiastic acclaim by a not-inconsiderable group whose ardor for Sheldon's thesis is in no way tempered by their utter lack of any qualifications which would fit them to evaluate it.

The history of phrenology would, I think, incline one to be more charitable towards Sheldon's doctrine than are many of its critics, though, at the same time, considerably less sanguine as to the value of its ultimate contribution than are its more ardent apologists. It would prompt one, too, to urge a careful testing of Sheldon's conclusions by well-qualified and unprejudiced investigators.

Such an objective test would go far to determine what is sound in Sheldon's formulation. It might also serve to disclose whatever factual basis there might be for man's persistent attempts through the ages to learn to read in the external appearance of another reliable clues to his character and temperament. There is the possibility, too, that, as in the case of its historical analogue, phrenology, researches designed to test Sheldon's doctrine might produce findings which are more important than the system which they set out to examine.

Thus far, in this paper, I have attempted to point out a few of the ways in which a familiarity with some of the content and the techniques of anthropology can be helpful to the student and to the practitioner of medicine in their work. In closing, permit me to mention some other facets of anthropology which can make its pursuit a very appropriate and rewarding avocation for the physician or surgeon.

An area of anthropological literature which should prove especially interesting to medical practitioners is that dealing with folk medicine. One has only to recall the history of the discovery of digitalis, of quinine, and more recently, of the medical efficacy of extracts of Rauwolfia to recognize the possibility that many other valuable therapeutic substances may still reman undiscovered in the pharmacopoeias of various national and racial groups. Even if one has no such serious quest in mind, merely reading about the methods and materials used by various peoples in the treatment of injury and disease can be a diverting and, occasionally, a very informative experience.

The physician might also gain from the literature of anthropology some additional insight into his own vagaries and those of his professional brethren. A look into the practices of those societies in which the role of the medicine man is closely identified with that of the priest will, perhaps, help the physician to view more objectively some embarrassingly similar attitudes which are occasionally betrayed by spokesmen for his medical organizations. It is unfortunately true that the tendency to confuse the physician with the priest is not limited to so-called "primitive" societies.

Because of the nature of his relationship with his patients, the physician has an almost unique opportunity to observe human nature as it really is, unobscured by the numberless little devices which man has hit upon in order to hide his weaknesses from the view of his fellow-men. The study of other societies reveals the ubiquity of both the noble and the perverse in man's

nature and also discloses the thinness of the veneer with which his religions and his other social institutions have succeeded in overlaying it. Such knowledge makes for a more sympathetic understanding of man's frailties, an attribute of every physician worthy of the name.

I hope that, despite the rambling character of these remarks, I have succeeded in showing why I believe that anthropology offers enough that is important to the student and to the practitioner of medicine to justify its recognition as one of the ancillary medical sciences. I trust, too, that you will agree that, early in his training, the medical student should be made aware of the content of the various fields of anthropology and of how they can be of service to him in his professional work and as a means of enriching his intellectual life.

2. *Anthropology and Human Variation*

J. Lawrence Angel, *The Daniel Baugh Institute of Anatomy, The Jefferson Medical College, Philadelphia, Pennsylvania*

Anthropology grew from man's curiosity about himself. It arose when anatomy had already finished its gross mapping of the human body and was starting both to study function in earnest and to use the microscope. At the end of the 18th century, stimulated by the earlier voyages of discovery, anthropology began as classification of the varieties of mankind (Blumenbach): it dealt with groups rather than with individuals and with varieties rather than with primary uniformity. Just as the gathering of descriptive data on these varieties was becoming scientific through use of measurements the focus was split and sharpened to a search for causes in both biological and ethnological areas of anthropology. This change in attitude, resulting from the Darwin-Wallace theory of natural selection plus the later discovery of genetic processes on the one hand and from the demography and power-increase of the Industrial Revolution on the other hand, has meant a shift to the experimental phase in physical anthropology almost before the descriptive task has begun.

Thus to the original concern over variation between populations is added the study of variation within populations or between individuals in population subsegments. Also we can study variation within individuals as seen during growth or in adaptation to change in temperature or diet. Our focus, however, is on the past evolution and present status of populations rather than individuals, in the hope of finding relationships which may apply to both. By handling primate and human history as a series of evolutionary experiments we have hoped to see the interaction of genetic forces (mutation, hybridization) with changes in population size, with isolation, and with selective forces in the environment.

Dealing with the classical problem of variation between different races, C. S. Coon and others of us have noted that man follows the principles of climatic adaptation inferred by Bergmann, Allen and other zoologists and summarized by Rensch. These concern pigmentation and other bodily responses to light waves and heat and the ratio of body surface area to either total or lean body mass: racial varieties living in desert regions stress linearity of build with an expansive surface while there is increasing predominance of mass in body build as one progresses through forest-dwelling and temperate plains forms to subarctic races. These differences are partly true interpopulation variation, a result of genetic factors selected by different ranges of temperature and diet, and partly intra-individual variation, a result of growth plasticity which can be shifted in one generation by a sufficient change in environment (as seen in migration studies of Boas, Shapiro, Lasker, and others). The studies of Behnke, Keys and Brozek, Dupertuis, and others on tissue masses and blood volume will eventually make these applicable to variation between individuals. Meanwhile R. Newman, Baker, and physiologists working with arctic adaptation have shown that racial differences in subcutaneous fat thickness and in vasomotor response accompany slight but real performance differences under stress of heat or cold.

Other interpopulation variations result from chance shift in gene frequencies or mutation pressures during change in size of small breeding groups ("drift"), or from isolation or mixture in accord with mathematical models and animal experiments of Wright, Haldane, Dobzhansky. Since the rate of evolutionary change, or time variation, of a single combine of breeding groups tends to slow down with rapid in-

crease in population but may speed up with hybridization, the present rise in world population density is having interesting effects.

Such contrasts between races gain medical importance as formerly isolated peoples grow and migrate and mix. But medicine's main interest in variation is in what goes on within a single people.

This variation within a whole unitary population is usually analyzed by measurement of single traits of functional importance, such as stature, or blood-pressure, or skin color, or serum cholesterol in a random sample of the whole or of a properly chosen segment of the whole population. For example, one can measure the variation of systolic blood-pressure in "healthy" white males aged 30-34 in terms of the normal or bell-shaped curve of distribution of blood-pressure values below and above a mean value of about 126 mm of mercury. The actual variation, measured as Sigma, the standard deviation (or as the coefficient of variation, V, derived from it in ratio with the mean) and modified if necessary by a measure of skewness and perhaps kurtosis, is by no means a statistical abstraction. If the population and the sampling are unbiassed the distance of 1 x Sigma on each side of the mean will include just over two-thirds of the population, 2 x Sigma will include all but 4.55%—over 2% in each tail of the normal curve—and 3 x Sigma will cover the whole range, practically speaking. We can also divide the range into percentiles on the basis of Sigma. This sort of pictorial subdividing of the variation introduces the problem of the clinically normal versus the pathological.

Where does normal variation end?

As increasing control over infectious diseases and over nutritional deficiencies raises our life expectancy, all the chronic diseases (including collagen-failure and psychosomatic diseases) from cardiovascular-renal breakdowns and cancer to arthritis, obesity, peptic ulcer, and alcoholism have become much more pressing. Likewise the medical approach is necessarily becoming much more preventive. It is more vital to know where biologically normal variation in any trait ends. In our example cardiovascular function is definitely impaired when blood pressure is below the 3rd or above the 97th percentile (roughly 2 x Sigma from the average), but are *all* males of 30-34 with systolic blood-pressures between 100 and 155 functionally normal? Clinical records suggest some shortening of life in the group with pressures over 140. Hence it can be assumed (Masters, Dublin, Marks) that some impairment is likely in a transitional range outside the 10th and 90th percentiles (100-110 and 145-155). But many people do live efficiently into old age with blood pressures over 145 or even 160, and some with hypertension of 170/95 or more. In these cases other traits must offset this absolute excess and should be identified and correlated in predicting any person's total "normality."

Normal and efficient survival is a matter of variable combination of variable traits in each person. This is the humanly insoluble problem of intra-individual variation covering an almost infinite number of combinations of bodily arrangement within the biochemical functioning capacity of tissues and organs. Presumably two-thirds of these work within about one standard deviation of their average values in the population. But in each person one would expect a small percentage of traits to lie outside the fully normal range. Clearly a functioning person is much more than this composite of traits. In any attempt to study the variable individual rather than the measurable trait some investigators have split their samples into types. These may have considerable visual and semantic usefulness. But types fail to be precise tools because of the very complexity of intercorrelations which their users hope they can cut through: if one classifies people according to a tripartite subdivision of only three traits 27 types will emerge!

Yet the variation between certain logical subgroups is of extreme medical interest. For example in study of blood pressure (Murrill) it may be meaningful not only to take racially similar males and females as separate subgroups, but also to group by age, by type of nutrition, and by some measure of body mass or weight. In this way one can begin to see how much of the population's total variation in this trait is contributed by race, by sex, by body build, by age change, and by environmental factors. This can be measured both by comparing differences with the standard errors derived from the normal curves of samples compared and by determining the contribution of the variance of each sample to the total variance. Such study of variation, vital in future field work in public health, demands a truly enormous coverage to get representative and comparable samples. In all such comparisons the variation from sampling (standard error as standard deviation, of successive samples) and the observational "error" must be noted with care.

Variation between the sexes, for example, not merely in body form and function, but also in frequency of diseases and in viability is a vital part of medical education;

the causal balance between genes and endocrines and environment here is documented with many studies as well as summaries by Ellis and Montagu. Disease groups form logical populations to reveal ways in which sufferers from, e.g., essential hypertension, differ from the average physically, physiologically and psychologically. Likewise the effect of climate and of nutrition in retarding or accelerating growth and thus increasing variation in body size and proportions through differential growth is important. The further importance of differential growth as a factor in genetically caused simultaneous variation of bone, viscera, nerve, and blood-vessel pattern of one region has been shown in animal breeds (Sawin) where number of lumbar vertebrae correlates with form of lumbar plexus, presence or absence of gall-bladder, and pattern of coeliac artery branching. Pattern variation in man, generally shown separately for bones or for arteries, is important to the surgeon and is most easily classified and measured by grouping arbitrary varieties. The more precise strengths of genetic versus external factors in variation can be judged from twin studies: although identical twins often have the same diseases and usually the same abnormalities, one often differs in the response to the pathology.

A chief result of teaching anthropology with anatomy should be concrete pictures of the kinds and sources of variation between people as individuals. Student measurement of body diameters, pulse, taste-blindness, blood-types, etc. on themselves is effective where possible. At least the subjective comparison between 40 or 50 cadavera will wipe out any concept of the "typical" normal person. The corollary appreciation of each person's uniqueness and flexible adaptiveness during life should prevent any student from hasty labelling of a patient as "pathological."

Finally, we are living in a society which is heterogeneous to a degree never before in history approached on such a big scale. This is cultural, racial, and individual heterogeneity which in statistical terms is less bimodal or multimodal than like an irregularly flattened or skewed curve because of the immense and stimulating forces toward unity in the relative freedom of a successful society. It is less important that our immediate ancestors came from all parts of Europe, Africa, and southern and eastern Asia than that our growth of population and speed of communication create a social closeness most stimulating to psychologically normal people with or without biological mixture. This active process of fusion of the American population offers the new generation of medical men social as well as medical challenges. A Yankee farmer and a Greek restaurant-owner learn quite diverse attitudes toward death, disease, and their families. These differences must be understood by any doctor managing either a preventive or a therapeutic program. He must also be ready for the rapidity of the social and biological changes which both demand and follow such preventive programs. Here the essence of human variation is that each person's reaction to it is as significant as the variation itself.

3. *Medicine's Third Dimension*

BENJAMIN D. PAUL, *Harvard School of Public Health, Boston, Massachusetts*

Medicine as we knew it long ago broke away from the tradition of the priest and shaman. It rejected preoccupation with the psychical and mystical and became engrossed in the workings of the human body. Dramatic developments in the basic sciences led to equally spectacular medical conquests. For a while there was a danger that these technical advances would be attained at the cost of losing sight of the patient as a person. But as organic medicine consolidated its new gains, it found itself in a firm enough position to accept again what it had left behind long ago. It readmitted the psychical and mystical, but it did so in the modern idiom by recognizing "psychological medicine." Dynamic psychiatry and psychosomatic medicine reflect this newfound interest in the workings of human emotions.

Medicine now sees the patient in two dimensions, the organic and the psychological. This may give the physician a good picture of the patient, for it takes but two dimensions to make a pictorial representation. But if the physician wishes to look beyond the picture and see the patient as he really exists in the round, the physician will have to add another dimension to his medicine—the cultural dimension.

I believe that one of the notable innovations in medical teaching during the next

decade will be to familiarize students with the concept of culture. It remains for most medical schools to discover cultural anthropology, and it remains for anthropologists to discover ways to make the concept of culture meaningful to medical students.

An example will make clearer what I mean by the cultural dimension. A well-trained physician was working on a public health project in South Africa bringing preventive and therapeutic medicine to a Zulu group. Dr. John Cassel, who has since accepted a teaching post at the University of North Carolina School of Public Health, relates that he was called in one day to see an old Zulu man who had an apical cavity in one lung. It was apparently a very severe case of tuberculosis, and the prognosis was poor. The doctor advised the family to come to the clinic for drugs. They did not do so. Instead they called in a woman witch doctor who diagnosed that the old man was the victim of witchcraft perpetrated by the man's only son and the son's new bride. Incensed, the old man drove the couple from his home and took steps to disinherit his son. A month later Dr. Cassel was surprised to learn that the old man, instead of dying, was up and about. The physician decided to go into the whole story more deeply, and this is what he found.

The old man was proud of having lived a good life, raised a family and erected one of the finest homes in the area. His son, however, had become a ne'er-do-well, squandering the father's money in town. When the old man got too old to support the family, the oldest daughter went to work and sent her savings back to buy goats and cattle and build new huts. The son would come home periodically and assert his rights as an heir, demanding that goats and cattle be killed for a feast, in accordance with Zulu custom. When the daughter objected, pointing out that the cattle had been bought with her money, the son got furious. As a woman, his sister should have no status in the house; he told her to leave the family council. When the father sided with the daughter, the son appealed to the neighbors who brought pressure on the father to uphold tradition. The father resisted, and relations between son and daughter became embittered.

Without asking the father's consent, the son then married an undesirable town girl and persuaded the unhappy father to part with 11 head of cattle for the bride price and to take the girl into his home. There the girl came to blows with her sister-in-law. Eventually she committed the rudest of social breeches: she spit in the eye of her father-in-law. At that point, the old man became ill, and Dr. Cassel was called in, to be followed by the astute witch doctor who branded the son and daughter-in-law as malevolent agents. It should be mentioned that witches do their injury by poisoning the victim and that the symptoms of bewitchment, including loss of weight and spitting up blood, are virtually the same as those of tuberculosis.

Dr. Cassel remarks in retrospect: "When I was called in to diagnose the case, my total diagnosis consisted of a hole in the lung, and I missed all the psychological and cultural factors. The witch doctor, on the other hand, had diagnosed the whole set-up and had missed only the hole in the lung. Of the two, I should imagine that her diagnosis was more complete than mine."

In this Zulu instance the organic, psychological and cultural dimensions are easily perceived. Cultural determinants loom larger in an exotic setting than they do at home; but this difference is an artifact of perception rather than an objective distinction. Within our own society we see organic illness because it contrasts so clearly with organic well-being; we are learning to recognize emotional aspects of illness, thanks largely to psychiatry and psychology. But the cultural component in medicine remains elusive because we are too much enmeshed in our own customs and values, easily assuming that our assumptions and reactions are "natural" rather than influenced by the culture that is characteristic of our society.

Just as the organic functioning of one body can be better comprehended by comparing it with another that functions differently, so the effect of our own culture upon sickness and medicine can be better understood by comparing it with the divergent culture of an alien people like the Zulus. The contrast helps us bring into the observable foreground the unperceived "background phenomena" of our daily lives. To introduce the cultural dimension into medical teaching, we should be able to present striking cases from afar in order to arouse awareness. We must also find suitable domestic instances of the same cultural principles, however, so that the lesson can have practical value for doctors more likely to practice in Philadelphia than Natal. Potentially rich repositories of case material for showing the influence of culture are to be found in the social class system and the series of ethnic divisions that make up America.

In the ethnic area, for example, the anthropologist Mark Zborowski is gathering data on cultural aspects of the pain experience as evidenced by Italian, Jewish, Irish

and Old American patients in a veterans hospital. Thus Jewish and Italian patients are like each other, and different from the others, in responding expressively to pain sensations, but Jewish and Italian subjects differ from one another in their attitude toward pain. Italians are more oriented toward the present and regard pain primarily as an unpleasant state; they respond well to anodynes and have confidence in the doctor. Jews are more oriented toward the future and worry more about the symptomatic meaning of pain; they are sometimes suspicious of pain-relieving drugs and incline to have less confidence in the competence of doctors. Doctors from Old American background characteristically assume that the appearance of suffering should be suppressed. Confronted by Jewish or Italian patients whose culture disposes them to express their feelings, these doctors understandably but unjustly think the patients are "exaggerating" and putting on an insincere act.

And in the area of social class, for example, Frances Cooke Macgregor has found that plastic surgeons tend to exhibit cultural bias in dividing applicants for cosmetic surgery into two groups—those with "realistic" and those with "unrealistic" expectations. There would be merit to this distinction if the applicants could be sorted on good psychological grounds. Plastic surgeons could then avoid requests and lawsuits from persons who have neurotically unrealistic hopes that a different twist to their nose might bring them fame and affection or solve deep-seated impairments of personality functioning. But many plastic surgeons unconsciously make their discriminations on the basis of surface criteria. Applicants whose manners and dress go with gentility tend to be perceived as having realistic reasons for cosmetic surgery, while those who seem poor and dress more slovenly tend to be judged as having unrealistic aspirations. There is thus a culture-bound bias in the physician's intuitive evaluation which can rebound against him.

It might help Zulu witch doctors to know more about organic medicine, but it would be less useful to teach them the concept of culture. They usually deal with a relatively homogeneous population so that their own outlook and intuitions resonate reasonably well with those of the average patient. Why should the concept of culture be conveyed to American medical students who expect to work with American patients? Part of the answer has already been indicated: America is a complex society with numerous subgroups and subcultures. In a sense, most American doctors work in a cross-cultural setting without leaving the country.

The rest of the answer concerns the process of becoming a doctor. Most students enter medical college with a high service motivation, but they lose much of this during the two years of preclinical training. Under heavy pressure to absorb a great deal of basic information in overly condensed courses, they withdraw from general social participation. And the art of medicine, the ultimate goal of their training, is dimmed by the brighter attraction of the laboratory sciences. As the students leave the classrooms for the hospitals in the third year, they need to be reintroduced to service and society. They have to learn that there are persons who have illnesses, and not just symptoms or organs to which people are attached. The concept of culture can be an important bridging device for overcoming their "trained incapacity," enabling them to assume the standpoint of the patient and see the world as it appears from the culturally-conditioned outlook of the patient.

To absorb the meaning of the cultural dimension, medical students ideally need to have direct *experience* to give depth to their understanding, acquire *concepts* to structure their thinking, and discuss *case studies* to give range to the conception of cultural variation. They can get experience through properly supervised training programs in comprehensive medicine which bring them into the home and the neighborhood. Anthropologists can provide lectures on culture and related concepts; on this score physical and other anthropologists can readily refresh their memories by consulting any number of good textbooks on cultural anthropology.

One teaching bottleneck is the shortage of medically oriented case material for use in discussion groups. To help overcome this deficiency, the Russell Sage Foundation has underwritten my efforts over the last few years to collect a series of case studies of social and cultural factors in public health. These cases, which are about to be published, have been tried out with good results in seminar sections of a required introductory course on biological and social ecology at the Harvard School of Public Health. Some of them should be suitable for instruction in medical schools. One of the case studies is about the Zulu, others concern communities in India, China, Thailand, the Pacific, Brazil, Chile, Peru, Guatemala, Mexico, Puerto Rico, Saskatchewan, Colorado, Alabama and Massachusetts.

If recognition is given to organic medicine and psychological medicine, recognition might also be extended to "cultural medicine." It may be misleading, however,

to speak of three kinds of medicine. Actually, there should be one medicine with three dimensions. Like physicians, anthropologists encompass both the biological and social realm, and are in a strategic position to draw the attention of medical students to the significance of the cultural dimension.

* * *

I have addressed only the problem of medical teaching. At the level of research, anthropology can also make contributions to medicine, of course, but here we are on a two-way street. Medicine often opens the gates to unique individual and community research opportunities and thus can facilitate advances in basic social science.

Appendix E

List of Educational Films

These films were shown at the Institute.

EMBRYOLOGY AND PATHOLOGY OF THE INTESTINAL TRACT

14.5 min., sd., color, 16 mm., 1954. Available from Lawrence Chaffin, M.D., C/O Children's Hospital, 4614 Sunset Blvd., Los Angeles, Calif. and Medical Audio-Visual Institute of the Association of American Medical Colleges, 185 N. Wabash Avenue, Chicago 1, Ill. *Rental:* $7.

THE BLADDER (Reel 4 of The Autonomic Nervous System)

13 min., sd., color, 16 mm., 1955. Available for loan from the National Foundation for Infantile Paralysis, 120 Broadway, New York 5, N.Y.

FRACTURES OF THE FEMUR ABOUT THE HIP

21 min., sd., color, 16 mm., 1955. Available from the V.A. Central Office Film Library, Vermont Avenue & H Street N.W., Washington 25, D.C.

NERVE BLOCKS AND NERVE LESIONS

4 reels (Double Nerve Blocks (7 min.); The Median Nerve (9 min.); The Radial Nerve (12 min.); and The Ulnar Nerve (10 min.), 38 min., sd., color, 16 mm. Available from the National Foundation for Infantile Paralysis, 120 Broadway, New York 5, N.Y., and Medical Audio-Visual Institute of the Association of American Medical Colleges, 185 N. Wabash Avenue, Chicago 1, Ill. *Rental:* $2 each or $2 for entire 4 reels.

FUNCTIONAL ANATOMY OF THE HAND

40 min., sd., color, 16 mm., 1951. Available from the National Foundation for Infantile Paralysis, 120 Broadway, New York 5, N.Y., and Medical Audio-Visual Institute of the Association of American Medical Colleges, 185 N. Wabash Avenue, Chicago 1, Ill., *Rental:* $2.

MOTOR DISORDERS IN NERVOUS DISEASES

si., b&w., 16 mm., 1946, in the following parts: Abnormal involuntary movements (30 min.) *Rental:* $6. Disorders of gait (40 min.) *Rental:* $7. Disorders of coordination (40 min.) *Rental:* $7. Muscle status (35 min.) *Rental:* $6. Reflexes (35 min.) *Rental:* $6. Skilled acts (35 min.) *Rental:* $6. Oculomotor disorders (25 min.) *Rental:* $5. Facial palsy (30 min.) *Rental:* $6. Disorders of the vestibular function (25 min.) *Rental:* $5. Disorders of motor trigeminal, spinal accessory, and hypoglossal nerve (25 min.) *Rental:* $5. Available from the Center for Mass Communication of Columbia University Press, 1125 Amsterdam Avenue, New York 25, N.Y. at rental fees noted above.

EMBRYOLOGY OF THE EYE

43 min., sd., color, 16 mm., 1950. Available from Sturgis-Grant Productions, Inc., 322 East 44th Street, New York 17, New York, *Rental:* $3.

AUTONOMIC INNERVATIONS OF THE EYE

21 min., sd., color, 16 mm., 1955. Not released for distribution, June 1956.

Appendix F

Annotated Bibliography on Anthropology

This list presents selected books and journals in the field of anthropology as related to medical education. The collection, except for titles indicated with an asterisk (*), was displayed at the Institute.

CULTURAL FACTORS IN MEDICAL EDUCATION

ETIOLOGY

SIMMONS, LEO W., and WOLFF, HAROLD G., "Social Science in Medicine," Russell Sage Foundation, New York, 1954.

A sociologist and a physician report how newer developments in the social sciences can supplement medical techniques in the treatment of disease.

CARE

SAUNDERS, LYLE, "Cultural Difference and Medical Care: The Case of the Spanish-Speaking People of the Southwest," Russell Sage Foundation, New York, 1954.

A few simple but important generalizations about medicine and culture and the interrelations between them, noted by a social scientist who has been working in an American medical setting with Spanish-speaking groups.

PROGRAMS

*PAUL, BENJAMIN D., editor, "Health, Culture and Community: A Book of Cases," Russell Sage Foundation, New York (to be published).

MEDICAL WORKS MANIFESTING THE VIEWPOINT OF PHYSICAL ANTHROPOLOGY

GOFF, CHARLES W., "Legg-Calvé-Perthes Syndrome and Related Osteochondroses of Youth," Charles C. Thomas, Springfield, Ill., 1954.

A book describing the incidence and treatment of a deforming disease of the hip. Principles of anthropology are applied throughout by the author who is both an orthopedic surgeon and an anthropologist.

KAPLAN, EMANUEL, "Functional and Surgical Anatomy of the Hand," J. B. Lippincott Company, Philadelphia, 1953.

Studies of gorilla, chimpanzee, rhesus monkey and baboon sometimes offer opportunities equal to planned experiments. This work refers to comparative primate anatomy to explain function and to understand structure. Another standard clinical work on the hand—Bunnell, Sterling, "Surgery of the Hand," J. B. Lippincott Company, Philadelphia, 1948 (2nd ed.)—also introduces a section, "Phylogeny and Comparative Anatomy," pp. 3-30, for this purpose.

JONES, FREDERIC WOOD, "The Principles of Anatomy as Seen in the Hands," Williams and Wilkins, Baltimore, 1942 (2nd ed.).

Uses comparative anatomy especially of primates and human variability to explain many of the points taken up from the clinical point of view by Kaplan and Bunnell. Frederic Wood Jones has also written a companion work, "Structure and Function as seen in the Foot," Balliere, Tindale and Cox, London, 1949 (2nd ed.).

LAKE, NORMAN C., "The Foot," Balliere, Tindale and Cox, London, 1952, (4th ed.).

See Chapter I, "Evolution of the Foot," pp. 1-30, and Chapter II, "The Evolutionary Factor in Aetiology," pp. 31-40. Also Chapters III, "Development," IV, "Anatomy," VI, "Gait."

*THOREK, MAX, "The Face in Health and Disease," F. A. Davis Company, Philadelphia, 1946.

Anthropological concepts are introduced in Chapter III, "Evolution of the Face," pp. 20-35; Chapter IV, "Mimetic Musculature," pp. 36-79; Chapter VI, "Facial Types," pp. 129-153; and Chapter VII, "Facial Decoration, Adornment and Customs," pp. 154-162.

CAFFEY, JOHN P., "Pediatric X-ray Diagnosis, a Textbook for Students and Practitioners of Pediatrics, Surgery and Radiology," The Year Book Publishers, Chicago, 1945.

An approach parallel to that of anthropologists is introduced in various sections on development, especially those concerning bones of the limbs, etc.—e.g., pp. 557-590.

ILLINGSWORTH, R. S., "The Normal Child, Some Problems of the First Three Years and Their Treatment," Little, Brown & Company, Boston, 1953.

This is another clinical work employing anthropological concepts in "The Assessment of Physical Development," Chapter IX, pp. 81-89, and "The Study of the Skull," Chapter X, pp. 90-94.

PHYSICAL ANTHROPOLOGY AND RELATED SUBJECTS

GREULICH, W. W., and PYLE, S. I., "Radiographic Atlas of Skeletal Development of the Hand and Wrist," based on the Brush Foundation Study of Human Growth and Development initiated by T. Wingate Todd, Stanford University Press, 1950.

One of several works of value to physicians which stem from the anthropologico-anatomical growth studies of Todd.

*HARTMAN, CARL GOTTFRIED, and STRAUS, W. L., JR., "The Anatomy of the Rhesus Monkey (Macaca Mulatta)," Williams and Wilkins, Baltimore, 1933 (out of print).

A contribution of the student of comparative primatology is to aid experimenters using forms closely related to man.

BOYD, W. C., "Genetics and the Races of Man," Little, Brown & Company, Boston, 1950.

Modern anthropology is increasingly dependent on population genetics as on other studies of biological process. This work marks the coming of age of human population genetics. Medical applications are beginning.

MOURANT, A. E., "The Distribution of the Human Blood Groups," Blackwell, Oxford, and Charles C. Thomas, Springfield, Ill., 1954.

Blood group studies have been a two-way street for mutual advancement of anthropology and clinical serology. This work applies the findings to anthropology.

RACE, R. R., and SANGER, RUTH, "Blood Groups in Man," Charles C. Thomas, Springfield, Ill., (2nd ed.), 1954.

This work is a companion to Mourant's book, at the other end of the two-way street.

*NEGUS, VICTOR E., "The Comparative Anatomy and Physiology of the Larynx," William Heinemann Medical Books Ltd., London, 1949.

See Chapter I, "Evolution of the Larynx," pp. 1-17; Appendix I, "Observations on the Evolution of Man from Evidence of the Larynx," pp. 182-191; Appendix II, "Evolution of the Speech Organs of Man," pp. 192-200.

CLARK, W. E. LEGROS, "The Fossil Evidence for Human Evolution, an Introduction to the Study of Palaeoanthropology," University of Chicago Press, 1955.

The distinguished anatomist who has studied many of the fossil remains combines an up-to-date summary of them with a statement of his own view of their evolutionary significance. Addressed to interested physicians and biologists.

JOURNALS

American Journal of Human Genetics, The American Society of Human Genetics, Mount Royal and Guilford Avenues, Baltimore 2, Md.

American Journal of Physical Anthropology, Wistar Institute of Anatomy and Biology, Woodland Avenue and 36th Street, Philadelphia 4, Penna.

Human Biology, Wayne University Press, Detroit 1, Mich.

Appendix C

Roster of Participants—1955 Teaching Institute

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